

# REVIEW

OF

## APPLIED MYCOLOGY

VOL. XXII

MARCH

1943

HILLS (C. H.) & MCKINNEY (H. H.). **The effect of mosaic virus infection on the protein content of susceptible and resistant strains of Tobacco.**—*Phytopathology*, xxxii, 10, pp. 857–866, 1942.

Infection by the tobacco mosaic virus was experimentally shown to cause a marked increase in the total nitrogen content of a susceptible variety, Wisconsin-Havana-Seed, grown under conditions of low, medium, and high nitrogen nutrition [cf. *R.A.M.*, xix, p. 169; xx, p. 499]. Infected plants of the resistant T.I.448 A variety receiving a reduced nitrogen supply showed a decrease in total nitrogen content, which was not apparent, however, in those more liberally supplied with nitrogen.

The chlorophyll content of mosaic-diseased foliage of Wisconsin-Havana-Seed tobacco was 30 per cent. lower than that of healthy leaves, the chlorophyllase activity in the former being also correspondingly reduced. No such changes were observed in the infected leaves of T.I.448 A. Both susceptible and resistant strains underwent a decrease of oxidase activity as a result of mosaic infection, the diminution in the latter being only slightly less than in the former, so that a very small amount of virus nucleoprotein evidently suffices to produce measurable alterations in the metabolism even of a resistant tobacco variety.

REYNARD (G. B.). **'Dunking' Tomatoes for their health.**—*Sth. Seedsman*, v, 1, pp. 10, 30, 5 figs., 1942. [Abs. in *Exp. Sta. Rec.*, lxxxvii, 4, p. 539, 1942.]

Highly satisfactory results in the differentiation between tomato seedlings resistant or susceptible to grey leaf spot (*Stemphylium* [*solani*]) and early blight (*Alternaria* [*solani*]) have been obtained [in the United States] by dipping potted seedlings in a mixture of liquid cultures of the pathogens broken into fine particles by an electric stirrer [*R.A.M.*, xx, p. 546]. After two days in a moist chamber the plants are placed on a greenhouse bench for observation and the diseased ones easily eliminated. The method is also applicable in the field.

ALEXANDER (L. J.). **A new strain of the Tomato leaf mold fungus (*Cladosporium fulvum*).**—*Phytopathology*, xxxii, 10, pp. 901–904, 1 fig., 1942.

In this expanded account of his studies on the new strain of tomato leaf mould (*Cladosporium fulvum*) pathogenic to the normally resistant Globelle variety, a note on which has already appeared [*R.A.M.*, xix, p. 308], additional evidence is presented to show that the host range of the fungus is not restricted to the domestic species, all the 30 plants of Red Currant (*Lycopersicum pimpinellifolium*) inoculated with the Globelle strain contracting infection while remaining immune from attack by that from Globe. Sixteen plants of the ordinarily resistant Vetomold variety, immune from the Globe strain of *C. fulvum* [*ibid.*, xxi, p. 172], succumbed to infection by the new one, as also did 15 of Bay State. The disease does not assume such a severe form on Globelle as on Globe.

The slight differences in the spore dimensions of the two strains, averaging 3.89 by 1.80 and 3.84 by 1.74  $\mu$  for Globelle and Globe, respectively, are not regarded as significant.

SAMSON (R. W.). **A study of certain viruses pathogenic to the Tomato.**—*Proc. Ind. Acad. Sci.*, xlix (1939), pp. 77–83, 4 figs., 1940.

Reviewing the literature on tomato streak the author states that the earliest reference to this disease is by C. B. Plowright (*Gdnrs' Chron.*, ii, p. 532, 1887) [who attributed streak symptoms to *Cladosporium fulvum*]. In Indiana winter blight or streak is considered to be a double virus infection in which the two viruses concerned (belonging to virus groups 'A' and 'B') are of the tobacco mosaic and the healthy potato virus [potato virus X] type, respectively [*R.A.M.*, xiv, p. 261], one strain of the latter, originally collected on *Datura stramonium*, being very virulent. The writer gives a full account of his experiments on the synthesis and analysis of mixed virus streak. Sometimes the complete streak complex was recovered from the non-necrotic parts of Black Beauty eggplants and Cayenne pepper (*Capsicum frutescens*).

SELMAN (I. W.). **The relation between mosaic infection and yield reduction in glass-house Tomatoes.**—*J. Pomol.*, xx, 1–2, pp. 49–58, 2 graphs, 1942.

This is an expanded account of work already noticed from another source [*R.A.M.*, xxii, p. 9].

CROMWELL (B. T.) & HUNTER (J. G.). **Chlorosis in Tomatoes.**—*Nature, Lond.*, cl, 3812, pp. 606–607, 1942.

A chlorotic condition of tomato plants in the west of Scotland was investigated at the Agricultural College, Auchincruive, Ayr, and is tentatively attributed, on the basis of chemical analyses, to a deficiency of available magnesium, the content of which in the affected leaf blades amounted to only 0.10 per cent. dry matter as compared with 0.43 per cent. in normal foliage, probably aggravated by an unduly high concentration of potassium (0.1 to 0.3 per cent.) in the local soils. The particular type of chlorosis under observation, which was characterized by a bright yellow or greenish-yellow coloration of the interveinal areas, occasionally involving the margins, was commonly associated with the presence of root-rotting fungi, a poor physical condition of the soil, and low soil temperatures, all such factors tending to reduce the capacity of the plants to absorb an adequate quantity of magnesium.

RADEMACHER (B.). **Kupfermangelerscheinungen bei Forstgewächsen auf Heideböden.**

[Copper deficiency manifestations among forest stands on moorland soils.]—*Mitt. Forstw. Forstwiss.*, 1940, pp. 335–344, 7 figs., 1940. [Abs. in *Z. PflKrankh.*, lii, 7–8, p. 399, 1942.]

A three-year study has been carried out on the copper requirements of pine (*Pinus sylvestris*), spruce, larch, and birch in connexion with an extensive afforestation programme on the moorland soils of north-western Germany. Grown in pots of such soil, pines commenced in the first year to show deficiency symptoms comprising needle discoloration, stunting, and even dying-off in individual cases, a similar discoloration of the needles and weaker growth, accompanied by premature needle-shedding of the youngest shoots, being observed in spruce. In the second year the larches showed generalized stunting and an extraordinary creeping growth of certain shoots. In the case of the birches the admixture of copper with the soil failed to induce a favourable response, their development being retarded rather than advanced. As the amounts of copper available in the different soil layers vary, these results may not be applicable to field conditions without further testing. Evidence is adduced that the reaction

of different species to copper deficiency is hereditary, and it is thought probable that some hitherto inexplicable cases of 'dying-off' may be attributable to this cause.

COOLEY (J. S.). **Defoliation of American Holly cuttings by *Rhizoctonia*.**—*Phytopathology*, xxxii, 10, pp. 905-909, 2 figs., 1942.

At the United States Bureau of Plant Industry Station, Beltsville, Maryland, American holly (*Ilex opaca*) cuttings were severely attacked in 1936 and 1937 by *Rhizoctonia* [*Corticium*] *solani*, the symptoms produced by which included a cobweb-like appearance of the under sides of the leaves due to the adherence of hyphae and enmeshed grains of sand from the rooting medium, followed in two or three weeks by defoliation and the production of black sclerotia on the fallen leaves, a zonate leaf spot (not consistently present), and blackening of the petioles and parts of the leaf blades. The fungus was grown in pure culture on potato dextrose agar, on which the optimum temperature for its development was between 25° and 30° C., the minimum and maximum being below 15° and over 30°, respectively. The differences between the holly isolate and a potato strain of *C. solani* were insignificant. Among the flowering plants sustaining more or less severe damage when grown in a bed infested with the holly pathogen were *Begonia* (Lorraine type), *Buddleia davidi*, *Chrysanthemum*, *Fuchsia*, *Pelargonium hortorum*, and *Antirrhinum majus*. None of the chemicals used for the disinfection of the cutting beds gave satisfactory control of the leaf blight, which was effectively combated, however, by thorough sanitation, involving the renewal of the beds with fresh clean sand after disinfection of the benches and the adoption of precautions against recontamination.

CHRISTENSEN (C. M.) & KAUFERT (F. H.). **A blue-staining fungus inhabiting the heartwood of certain species of conifers.**—*Phytopathology*, xxxii, 8, pp. 735-736, 1942.

Each of the 50-odd northern white cedar (*Thuja occidentalis*) trees dissected by the writers during the past few years in northern Minnesota revealed extensive blue stain in the heartwood, usually occurring in the form of streaks above and below branches or stubs. The dark, slow-growing, non-sporulating fungus mainly or exclusively responsible for the condition is evidently identical with that described by the second-named author as the agent of heart rot of balsam fir [*Abies balsamea*: *R.A.M.*, xvi, p. 77] and by Crowell as causing heart blue stain of the same host and white spruce in Canada [*ibid.*, xix, p. 630]. In over 100 isolations the blue-staining fungus was constantly associated with other organisms, but pure cultures of the former were obtainable by cutting hyphal tips on hanging agar drops.

Sterilized pieces of white cedar heartwood inoculated with the fungus under observation slowly became covered and penetrated by the mycelium, the constricted hyphae of which traversed the cell walls of the tracheids and rays. Dissemination is readily effected by means of hyphal fragments.

The dark-coloured fungus, with its associated organisms, was obtained in some 20 per cent. of several hundred isolations from a brown cubical trunk rot originating at the branch stubs, and a brown, feathery butt and trunk rot starting in the roots of *T. occidentalis*, as well as from the branch stubs of *A. balsamea*, and is also believed to inhabit the heartwood of western red and Port Orford cedars [*T. plicata* and *Chamaecyparis lawsoniana*, respectively].

VERRALL (A. F.). **A comparison of *Diplodia natalensis* from stained wood and other sources.**—*Phytopathology*, xxxii, 10, pp. 879-884, 1942.

To test the validity of his contention that the inoculum of *Diplodia natalensis*, the agent of a stain of timber and logs in Louisiana, is largely derived from other sources [*R.A.M.*, xix, p. 316], the author carried out comparative cultural studies on malt agar at room temperature and 37° C. of 16 isolates of the fungus from cotton bolls,

a tung [*Aleurites* sp.] root, a pear stem, an orange fruit, and pine, yellow poplar [*Liriodendron tulipifera*], *Magnolia*, and sweet gum [*Liquidambar styraciflua*] wood.

Although there were considerable variations at 37° among the various isolates in growth rate, spore dimensions, and gross macroscopic appearance, in none of their cultural characters did the wood strains differ appreciably from those from other hosts. Thirteen isolates tested on pine and sweet gum sapwood caused intensive staining, 14 produced rapid decay of oranges, and 11 caused black boll rot of cotton, but none of the ten inoculated into tung roots induced more than small temporary cankers.

On the basis of these studies the strain of *D. natalensis* responsible for the staining of wood is regarded as identical, at any rate for practical purposes, with the isolates from other hosts. Little fruiting of *D. natalensis* was observed on stained timber from which the fungus was isolated, and some of the inoculum inducing wood stain is probably derived from such plants as cotton.

MALM (M.). **The origin of slime formation in paper mills.**—*Svensk. PappTidn.*, xliv, 23, pp. 520–529; 24, pp. 554–557, 1941. [Swedish. Abs. in *Bull. Inst. Pap. Chem.*, xii, 9, pp. 297–298, 1942.]

Contradictory views having been expressed by previous investigators as to the fungal or bacterial origin of slime formation in paper mills, the writer attempted to identify the micro-organisms concerned in the development of this trouble at the Hallsta mill. Although it proved impracticable, either with pure cultures of the bacteria, yeasts, and fungi isolated from the slime and water of the mill, or with the material itself, to produce an artificial slime of the characteristic nature formed in the course of operations, certain types of fungi grew so rapidly in pure culture as to merit further study in this connexion, notably a species of *Cephalosporium*. Discoloration of the slime may be caused by *Cladosporium*, *Pullularia*, and other species of fungi.

BUSE (R.). **Versuche über den Einfluss der Lagerungsart osmotierter Hölzer auf die Eindringtiefe des Imprägniersalzes in das Holz.** [Experiments on the influence of the mode of storage of osmotized timbers on the depth of penetration of the preservative salt into the wood.]—*Holz Roh- u. Werkstoff*, v, 5, pp. 156–160, 4 figs., 1942.

Following up the experiments of Liese and Schubert on the osmotic method of timber preservation [*R.A.M.*, xx, p. 505], the author carried out a series of tests in the summer of 1940 at the Zicher (Neumark, Germany) Forestry Station to determine the influence of the mode of storage on the depth of penetration of two preservatives, viz., thanalith U, consisting of 26, 12, 37, and 25 per cent., respectively, of sodium fluoride, dinitrophenol, sodium dichromate, and sodium arsenate, and osmolit UA, composed of 26, 35, 24, and 10 per cent., respectively, of sodium fluoride, potassium dichromate, sodium arsenate, and dinitrophenol, with an admixture of 5 per cent. glue, one part of each being mixed with an equal quantity of water and applied in the form of a paste at the rate of 4 kg. per cu. m. to pine and spruce poles 7 m. in length. These were then stored for four months (1) in a wind- and water-tight, triangular pile; (2) in the same way, but without protection from the weather; and (3) laid side by side.

By means of the zircon-alizarin test, applied to freshly cut sections of the treated poles, it was ascertained that the average depths of penetration of the salts into pine and spruce stacked under cover were 2.5 and 1.8 cm., respectively, the corresponding figures for those piled up but left unprotected and for the lot placed side by side being 1 and 0.9 and 0.7 and 0.7 cm., respectively. It is apparent from these data that thorough protection of impregnated timber is essential, both to prevent the leaching out of the disinfectant and to maintain the wood in a sufficiently moist condition for the diffusion of the salts.

LINDEGREN (R. M.). **Chlorinated phenols on the wood-protection front.**—*Sth. Lumberm.*, clxiii, 2057, pp. 219-222, 7 figs., 1941.

This is a review of the properties, uses, and various methods of application of the water- and oil-soluble chlorinated phenols for the control of wood-staining and -destroying fungi, among the recently developed commercial products belonging to the former group [in addition to those already referred to in this *Review*] being permatox 10 S, a mixture of chlorinated phenols and borated chemicals particularly suitable for small mills and concentration yards, while the latter category includes permasan and permatox A, adapted primarily for the large-scale preservation of timber by the pressure and soaking treatments.

The outlook for the extension of the use of the chlorinated phenols is briefly discussed. Such a step is deemed advisable in the non-pressure and clean-treatment fields, and is justifiable in the case of the pressure system where a clean, paintable, or non-bleeding treatment is indicated, but the wholesale substitution of this group of chemicals for the standard pressure methods of impregnation with creosote-petroleum or creosote-coal tar, is not thought to be warranted at the present juncture.

DEARBORN (C. H.). **Boron nutrition of Cauliflower in relation to browning.**—*Bull. Cornell agric. Exp. Sta.* 778, 29 pp., 16 figs., 1942. [Abs. in *Exp. Sta. Rec.*, lxxxvii, 4, pp. 537-538, 1942.]

In the autumn of 1934 some 30 per cent. of the cauliflowers on 150 farms covering 443 acres in the Catskill Mountains were found to be unfit for marketing owing to browning of the heads, other symptoms of the disorder including a bitter flavour both in the raw and cooked state even in the absence of browning. The trouble was experimentally traced to boron deficiency [*R.A.M.*, xxi, p. 510] and was corrected by the use of borax, either mixed with the fertilizer and broadcast or applied in trenches near the rows. In a greenhouse test the fresh weight of treated whole plants exceeded that of the boron-deficient controls by 14.5 per cent., the corresponding increase for the heads alone being 44 per cent. The first manifestation of boron deficiency in the green plants occurred in the parenchyma cells of the pith and the stem cortex. Evidence from microchemical tests pointed to disorganization within the conducting system in an advanced stage of boron deficiency.

OWEN (F. V.), MURPHY (A. M.), & TOLMAN (B.). **Progress in breeding Sugar Beets for curly top resistance.**—Abs. in *Phytopathology*, xxxii, 9, pp. 828-829, 1942.

In many trials in the western United States high yields have been obtained from curly top-resistant sugar beets under conditions involving the total failure of European varieties [*R.A.M.*, xxi, p. 510]. U.S. No. 1, the commercial use of which dates from 1934-5, was soon replaced by Nos. 34, 33, and 12, of which, however, only the highly productive 33 will be extensively cultivated in the future. U.S. No. 22, now available to commercial growers, makes satisfactory growth under good cultural conditions even in the presence of curly top, some damage from which may result, however, if the plants are neglected or inadequately irrigated. A still higher degree of resistance to curly top is obviously desirable, but owing to the intensive self-sterility of U.S. No. 1 and all other resistant varieties so far produced, mass selection has hitherto constituted the chief means of improvement. Now, however, inbreeding experiments are facilitated by the existence of a number of self-fertile resistant lines.

BENNETT (C. W.). **Longevity of curly top virus in dried tissue of Sugar Beet.**—Abs. in *Phytopathology*, xxxii, 9, pp. 826-827, 1942.

In July, 1934, small sugar beet plants suffering from curly top were dried at room temperature and divided into four lots, of which (1) was exposed to the humidity of laboratory air throughout the test period of eight years; (2) was placed over calcium chloride in an air-tight container; (3) was also placed over calcium chloride in a

container in which air was replaced by hydrogen during the first year and admitted for the remaining period of the test; and (4) was stored in a container with hydrogen for the first year and air thereafter. Twenty seedling beets were inoculated annually from each lot, except in 1940, the following numbers contracting infection in the successive years: (1) 3, 3, 11, 0, 0, 0, 0, and 0, respectively; (2) 2, 2, 8, 3, 7, 0, 2, and 0, respectively; (3) 5, 1, 18, 1, 2, 2, 3, and 2, respectively; and (4) 3, 0, 12, 0, 0, 0, 0, and 0, respectively. The activity of the virus is thus maintained under thoroughly dry conditions for a period of at least eight years.

LACKEY (C. F.). **Relative concentrations of two strains of curly top virus in tissues of susceptible and resistant Beans.**—*Phytopathology*, xxxii, 10, pp. 910–912, 1942.

In some of the writer's studies on the relationship of the curly-top virus to root-tips of beets at Riverside, California, it was necessary to supplement the root tips of this host by those of two bean (*Phaseolus vulgaris*) varieties, one fairly resistant (Great Northern U.I.81) [*R.A.M.*, xx, p. 43] and the other (Bountiful) highly susceptible to the disease. The two virus strains used were those designated by Giddings as 1 and 4 [*ibid.*, xvii, p. 787], and after inoculation the cut root tips macerated in a 5 per cent. sucrose solution, were supplied to non-viruliferous leafhoppers, which were then caged singly on susceptible sugar beet seedlings. The tabulated results of the tests showed that in the resistant bean variety, the virulent virus 1 is promptly inactivated or its multiplication rapidly inhibited, whereas in highly resistant sugar beets, on the contrary, it was found to persist [*loc. cit.*]. In the root tips of the susceptible Bountiful, moreover, the virulent strain 1 quickly reaches a higher concentration than the less virulent 4 in contrast to the results with susceptible beets (author's unpublished data), in which the latter attains a slightly higher concentration than the former.

CARSNER (E.), PRICE (C.), & GILLESPIE (G. E.). **Effect of temperature on the epidemiology of Sugar-Beet downy mildew.**—Abs. in *Phytopathology*, xxxii, 9, p. 827, 1942.

Downy mildew [*Peronospora schachtii*] often assumes a severe form on sugar beets grown for sugar in the coastal districts of California [*R.A.M.*, xvii, p. 720] and on those raised for seed in the Willamette Valley of Oregon, and along Puget Sound, Washington, the epidemiology of the disease apparently depending mainly on temperature. Relatively low temperatures permit spore germination and the establishment of infection, but slightly higher ones are requisite for sporulation. At about 70° F. all development of the fungus is arrested [*ibid.*, xvii, p. 366] and mildly damaged plants begin to recover.

LE CLERG (E. L.), PERSON (L. H.), & MEADOWS (S. B.). **Further studies on the temperature relations of sclerotial isolates of *Rhizoctonia solani* from Potatoes.**—*Phytopathology*, xxxii, 8, pp. 731–732, 1942.

In further studies at the Louisiana Agricultural Experiment Station on the temperature relations of sclerotial isolates of *Rhizoctonia* [*Corticium*] *solani* from potatoes [*R.A.M.*, xx, p. 391], 63 of these from various States were compared in pure culture on potato dextrose agar at 20°, 25°, and 30° C. with two crown-rot and two dry-rot canker strains from sugar beet. As in the previous series of investigations, the potato isolates made the maximum radial growth at 25° (average colony diameter of two ranging from 46.5 to 62.5 mm.), while those from sugar beet grew best at 30°.

ANDRÉN (F.). **Förberedande betningsförsök mot *Ascochyta* hos Ärtor.** [Preliminary disinfection experiments against *Ascochyta* on Peas.].—*Växtskyddsnotiser, Växtskyddsanst., Stockh.*, v, 3, pp. 45–47, 1941.

The application to peas in greenhouse tests of uspulun dust at the prescribed

dosage of 2 gm. per kg. failed to control *Ascochyta pisi*, which yielded, however, to higher concentrations (up to 10 gm.), the incidence of infection falling from 40 to 16 per cent. and the yield simultaneously rising by from 63 to 77 per cent. The larger number of normal plants in the treated stands outweighed a slight toxicity of the fungicide at the maximum strength.

SCHROEDER (W. T.) & WALKER (J. C.). Influence of controlled environment and nutrition on the resistance of garden Pea to *Fusarium* wilt.—*J. agric. Res.*, lxxv, 5, pp. 221-248, 4 pl., 4 figs., 1 diag., 5 graphs, 1942.

In greenhouse and laboratory experiments in Wisconsin a pea variety (Wisconsin Perfection) resistant to wilt, *Fusarium oxysporum* f. *pisii* race 1 (*F. orthoceras* var. *pisii*) [*R.A.M.*, xix, p. 2], and another (Davis Perfection) susceptible to it, were grown under controlled conditions of temperature and nutrition in sterile sand artificially infested by means of a suspension of microconidia and hyphal fragments. The optimum sand temperature for disease development in plants of both varieties was found to be 27° to 30° C. and thus higher than that established by other workers [*ibid.*, viii, p. 215]. Air temperature had relatively little influence on wilt development. The fungus grew best at 28° when cultured in the same nutrient solution as that used for the sand cultures of the host, supplemented with 2 per cent. dextrose. In susceptible plants the severity of disease appeared to be directly proportional to the temperature within the range of temperatures studied (15° to 30°); a very slow wilt with leaf necrosis and abscission developed at low sand temperatures and a very rapid wilting at the highest; cortical decay occurred at all temperatures, but was most severe and involved only the lower internodes at the optimum temperature; at sand temperatures of 24° and 21° the fungus made the greatest progress up the stem. In resistant plants very slight incurving of the lower stipules and leaflets occurred at the low temperature and low nutrient concentration, and severe wilting at the very highest concentration and optimum temperature. At high temperatures and low nutrient concentration disease development in resistant plants was similar to that in susceptible ones at the low temperature.

When four nutrient solutions, differing only in total salt concentration and designated 0.1H (basal solution diluted to one-tenth), 1H (basal solution), 3H (concentration three times that of the basal), and 5H (concentration five times that of the basal solution), were used, the following disease responses were noted at different temperatures. At 21°, approximately the optimum temperature for the host, disease development in susceptible plants was retarded with an increase in the nutrient concentration, except in midwinter when light was poor and days were short; in resistant plants the disease was most severe in the 0.1H, less serious in the 1H, and absent in the higher concentrations. At 27° the disease was most severe in the 5H concentration, both resistant and susceptible plants developing severe cortical necrosis and rapid wilting; it was least severe in both resistant and susceptible plants in the 1H, and variable, but considerably more severe in the 3H solution, while in the 0.1H solution resistant plants developed severe slow wilting and susceptible ones wilted almost as rapidly as at the highest solution.

Microscopic examination of diseased resistant plants indicated extensive cortical and stelar penetration of the roots and stelar penetration of the first and second internodes, nodal isolation indicating still higher advances. Granular and gum-like depositions and scarcity of hyphal strands were observed in resistant plants at high temperature, but not in susceptible plants at either high or low temperature.

The results of cross-inoculations of susceptible and resistant varieties of tomato, cabbage, and pea plants with the respective fusarial wilt pathogens, *F. oxysporum* f. *lycopersici* (*F. bulbigenum* var. *lycopersici*) [*ibid.*, xxi, p. 432], the cabbage yellows organism [*F. conglutinans*: *ibid.*, xxi, p. 342], and *F. orthoceras* var. *pisii*, under conditions of high temperatures (27° to 28°) and low nutrition (0.1H concentration)

in sand culture, indicated that all three pathogens are specific to their respective hosts, producing no symptoms on the others although apparently capable of penetrating into them. Of the three species, only the pea wilt organism produced symptoms in both the resistant and the susceptible variety of pea.

DUNDAS (B.). **Breeding Beans for resistance to powdery mildew and rust.**—Abs. in *Phytopathology*, xxxii, 9, p. 828, 1942.

The reactions of segregating bean [*Phaseolus vulgaris*] populations to the various physiologic races of mildew [*Erysiphe polygoni*: *R.A.M.*, xx, p. 619] and rust [*Uromyces appendiculatus*: *ibid.*, xx, p. 555] may be determined by means of detached leaflets in Petri dishes. Pinto and other field beans, as well as some garden varieties, carry a main dominant factor for resistance to 12 of the 14 races of *E. polygoni* isolated, which is being incorporated into the new garden beans in course of development. There is further a dominant factor for semi-resistance, which induces susceptibility five to seven days after emergence.

Various types of garden beans have been found to contain a number of factors for rust resistance, appropriate combinations of which should result in resistance to all the 20 known physiologic races of *U. appendiculatus*. A combination of the factors for resistance in Golden Gate Wax and Brown Kentucky Wonder 298 has been used in breeding for resistance to four races, and several of the newly released varieties have shown resistance to certain races of the rust.

ARK (P. A.) & GARDNER (M. W.). **Root scab of Carrot caused by *Phytophthora carotae*.**—Abs. in *Phytopathology*, xxxii, 9, p. 826, 1942.

A serious root scab of carrots is caused in California by direct infection with the agent of leaf and umbel bacterial blight, *Phytophthora* [*Xanthomonas*] *carotae* [*R.A.M.*, xiv, p. 211], the disease being chiefly prevalent in irrigated fields in which carrots have repeatedly been grown. The small, brown or maroon spots characteristic of the early stages of infection may develop into sharply sunken constrictions or large, rough, depressed cankers, while subsequent attacks induce the formation of laterally elongated, brown or black, rough, scabby lesions, often protruding by reason of the immense bacterial masses exuding and embedding particles of soil. A specially objectionable feature of the scab is the healing-over of internal pockets of blackened, infected tissue on roots with a fairly normal exterior. Secondary fungi may invade the scabbed roots. *X. carotae* is able to persist in field soil for periods up to six months, and diseased roots discarded at harvest time should be removed. Ten minutes' immersion of the seed in water heated to 50° to 52° C. is recommended to prevent the infestation of clean soil.

LIHNELL (D.). **Mosaikbränna—en virussjukdom på Spenat.** [Mosaic blight—a virus disease of Spinach.]—*Växtskyddsnötiser, Växtskyddsanst., Stockh.*, v, 6, pp. 83–86, 3 figs., 1941.

During the latter part of the summer of 1941, spinach in two localities of Scania (extreme south of Sweden) was severely attacked by 'blight', the agent of which was identified as *Cucumis virus 1* [cucumber mosaic virus], this being the first authentic record for the country.

SHIFRIS (O.), MYERS (C. H.), & CHUPP (C.). **Resistance to mosaic virus in the Cucumber.**—*Phytopathology*, xxxii, 9, pp. 773–784, 4 figs., 1942.

For an understanding of the genetical mechanism involved in the manifestation of cucumber mosaic symptoms two developmental phases of the disease, viz., the cotyledon and composite true-leaf stages, must be clearly differentiated. The writers' inoculation experiments at the Cornell Agricultural Experiment Station, Ithaca, New York, on the resistant Chinese Long [*R.A.M.*, xi, p. 349], China, and Shamrock

varieties, the susceptible A(bbott) and C(obb), and Early Russian, and hybrids between Chinese Long and each of the two susceptible varieties yielded the following results. Three complementary genes appear to govern the ability or failure of the virus to induce cotyledonary chlorosis, the genetical ratio in the  $F_2$  being 27 non-chlorotic to 37 chlorotic. This ratio undergoes constant changes at the composite true-leaf stage, when several gene-modifiers also participate in the genetical control of virus symptoms, so that the frequency of symptomless plants is extremely low (three out of 523 in the  $F_2$ ). The presence or absence of cotyledonary chlorosis determines whether the tested plant is susceptible to, or tolerant of mosaic, and the degree of tolerance may be determined by the severity or mildness of the symptoms and by the relative distance from the cotyledons to the true leaf on which the symptoms first appear: the longer the distance, the greater is the resistance. All resistant stocks contain the three basic dominant genes, but they vary among themselves in the relative number of dominant modifiers.

The production by plant-breeders of symptomless cucumber varieties (which are economically superior to the 'tolerant' sorts with mild or severe symptoms on the first true leaf) involves the repeated crossing of symptomless selections with commercial types.

BERGSTRÖM (INGRID). **Knippbakterios på Melon m. fl. växter.** [Fasciation bacteriosis of Melon and other plants.]—*Växtskyddsnötiser, Växtskyddsanst., Stockh.*, vi, 3, pp. 42-45, 4 figs. 1942.

The most recent occurrence of *Bacterium* [*Corynebacterium*] *fascians* in Sweden is on melon, other hosts of the pathogen in the country being *Chrysanthemum maximum* [*R.A.M.*, xviii, p. 317], *Nicotiana glutinosa*, and sweet pea, while a certain type of gall on *Viburnum opulus* is tentatively attributed to the same source.

MILLER (L. I.). **Peanut leafspot and leafhopper control.**—*Bull. Va agric. Exp. Sta.* 338, 24 pp., 7 figs., 1942. [Abs. in *Exp. Sta. Rec.*, lxxxvii, 4, p. 534, 1942.]

The results of experiments in the control of groundnut leaf spots (*Cercospora* spp.) [*C. personata* and *C. arachidicola*] and the leafhopper [*Empoasca fabae*] on 70 farms in Virginia from 1938 to 1941 indicated that profitable yield increases may be secured by three to four applications of finely ground sulphur dust at fortnightly intervals [cf. *R.A.M.*, xxi, p. 402], the surplus thus obtained ranging from 238 to 834 (average 481) lb. nuts per acre on 30 farms. The increases in hay production on seven farms varied between 526 and 3,419 (1,674) lb. per acre. Both nuts and hay from the treated plants were of superior quality, ripening being delayed by five to ten days so that the crop could be left standing for a considerable period without appreciable loss of nuts through shredding. The inclusive cost of the treatment is estimated at \$3 per acre.

DU PLESSIS (S. J.). **'n blaarvleksierte van Wingerd veroorsaak deur Isariopsis fuckelii** (Thüm.) Du P. [A leaf spot disease of the Vine caused by *Isariopsis fuckelii* (Thüm.) Du P.]—*Ann. Univ. Stellenbosch*, Ser. A, xx, 1, pp. 1-26, 12 figs., 1942.

In this further paper on the vine leaf disease caused by *Isariopsis fuckelii* (Thüm.) comb. nov. in the Stellenbosch district of South Africa [*R.A.M.*, xxi, p. 278] the author gives a revised Latin diagnosis of the pathogen, which he transfers from the genus *Septosporium*. The fungus is characterized by basal, septate, simple, straight, densely caespitose, coremioid, fuscous conidiophores, arising from the pseudo-parenchymatous and subepidermal stromata, with plurigeniculate, flexuous, brown apices, 157.8 to 278.8 by 3.7 to 5.4 (average 217.8 by 4.4)  $\mu$ , and elongate to clavate or subfusoid, brown, granular, 2- to 10-septate conidia, tapering towards the rounded apices and obtusely rounded at the base, 34.7 to 77.8 by 5.4 to 9.2 (50 by 7.1)  $\mu$ . Saccardo's view of *S. fuckelii* as a synonym of *Cercospora roesleri* [*ibid.*, xviii, p. 91] is rejected on the basis of differences in the spore shape, septation, and dimensions between the two species.

**Plantesygdomme i Danmark 1940. Oversigt, samlet ved Statens plantepatologiske Forsøg.** [Plant diseases in Denmark in 1940. Survey of data collected by the State Phytopathological Experiment Station in 1940.]—*Tidsskr. Planteavl*, xvi, pp. 495–565, 1942.

The following are among the items of interest in this annual survey of phytopathological work in Denmark [*R.A.M.*, xix, p. 6]. Copper deficiency [reclamation disease] was exceptionally severe among barley and oats, especially in Jutland. Sulphur pyrites ash, applied at the rate of 700 kg. per ha. in mid-June, gave somewhat better control of the disease than copper sulphate.

Only one case of *Puccinia graminis* was reported on wheat, from the south of Jutland.

Chlorosis of apple trees was effectively combated by soil treatment with manganese and iron sulphates at the rates of 200 and 300 kg. per ha., respectively.

Potato wart (*Synchytrium endobioticum*) was detected in 15 new municipalities.

New records for the country include *Colletotrichum agaves* on *Agave* [*? americana*]: *ibid.*, xvii, p. 600] and *Septoria linicola* [*Sphaerella linorum*] on flax.

**Wissenschaftlicher Jahresbericht der Biologischen Reichsanstalt für Land- und Forstwirtschaft, 1940.** [Scientific Annual Report of the National Biological Institute for Agriculture and Forestry, 1940.]—*Mitt. biol. Anst. (Reichsanst.)*, Berl., 65, 1941. [Abs. in *Z. PflKrankh.*, lii, 9–10, pp. 459–463, 1942.]

Among the items of phytopathological interest in this report on scientific research work at the Biological Institute, Dahlem, Berlin, during 1940 may be mentioned the following. [G.] Nitsche and [H.] Förster (pp. 99–100) state that beet heart and dry rot developed in an exceptionally acute form in the Guhrau and neighbouring districts owing to the shortage of borax. Equally effective control, however, was shown to be obtainable by treatment of the soil with boron-containing lignite ash. The latter product, as well as 'Müll' and North Sea slime, also gave satisfactory results in [E.] Pfeil's field experiments in the control of the same disease (p. 50).

Three distinct variants of the tobacco ring-spot virus [see below, p. 109] were isolated by [E.] Köhler from potato plants affected by aucuba mosaic. The same worker found 1 per cent. sodium lye an effective antiseptic for the treatment of knives used in the thinning-out of tomatoes and cutting of potatoes as a precaution against tobacco mosaic and potato virus X transmission (pp. 21–22) [*R.A.M.*, xx, p. 602].

E. Pfankuch's further studies (pp. 51–52) on the 'mutations' of the tobacco mosaic virus experimentally induced [by irradiation: *ibid.*, xix, p. 437] showed that the rate of movement of such aberrant forms was uniformly slower than that of their progenitors. Similar 'mutations' could be isolated from plants which were perfectly healthy at the time of irradiation but were subsequently inoculated with non-irradiated virus. Evidence was obtained that differences in the effects produced by the virus and its mutants rest on qualitative and quantitative divergences in the nucleic acid portion of the molecule.

In [K.] Heinze's field trials the Sensation cucumber variety (A/G Terra) was among the types showing resistance to cucumber virus 1 [cucumber mosaic virus: *ibid.*, xviii, p. 803], while a similar response to soy-bean mosaic [*ibid.*, xx, p. 444] was exhibited by the Giessen and Dieckmann 1940 selections (p. 23).

The curl (star spot) disease of apricots and other Prunaceae described by Christoff from Bulgaria [*ibid.*, xviii, p. 746] as due to a virus is thought by H. Wenzl (pp. 92–93) to result from quite a different cause, i.e., unduly drastic pruning of the young trees in the nursery.

**Plant diseases. Notes contributed by the Biological Branch.**—*Agric. Gaz. N.S.W.*, liii, 9, pp. 424–428; 10, pp. 467–471, 15 figs., 1942.

After stating that the New South Wales Department of Agriculture has for some years encouraged the local production of disease-free bean [*Phaseolus vulgaris*] seed,

chiefly in inland areas, and is prepared to inspect seed crops for certification, the author gives brief, practical notes on the symptoms and control of halo blight [*Pseudomonas medicaginis* var. *phaseolicola*: *R.A.M.*, xix, p. 646; xxi, pp. 358, 512], mosaic, anthracnose [*Colletotrichum lindemuthianum*: *ibid.*, xvii, p. 716], *Fusarium* root rot [*F. solani* var. *martii*: *ibid.*, xx, p. 195], angular leaf spot [*Isariopsis griseola*: *ibid.*, xix, p. 326], 'scald' [*ibid.*, xxi, p. 62], and rust [*Uromyces appendiculatus*: *ibid.*, xxi, p. 244].

Local growers are advised to plant the resistant Tweed Wonder beans where losses from anthracnose are expected. The Stayley's Surprise variety is highly susceptible to root rot, and should be grown only in soil known to be unaffected; the other varieties commonly grown in New South Wales, viz., Tweed Wonder, Canadian Wonder, Hawkesbury Wonder, and Brown Beauty are moderately resistant to root rot, generally showing, when affected, only a slight reddening of the tap-root. The term 'scald' is applied to a non-parasitic condition found only in the Gosford-Wyong area; it is characterized by discoloration and death of portions of the leaf tissue. Affected plants are stunted and give a small yield; if numerous plants are attacked, crop failure may ensue. The first symptom of scald is a collapse of tissue between the main veins and along the edges of leaflets. The collapsed tissue is light greenish-, later yellowish-brown, and after this change, a withering of the tips or edges of leaflets, or of whole leaflets, may set in, imparting a blighted appearance to the plants. The condition is associated with seed raised and again planted in acid soils ( $P_H$  4.2 to 5), while similar seed, planted in fertile soil of low acidity, gives healthy plants. Scalded plants contain several times as much manganese as healthy ones. The disease may be avoided on land where it is known to occur by planting seed raised in inland districts or in non-acid soils. Heavy applications of dolomitic lime a few months before planting are worth trying.

In experiments by H. Parry Brown on the control of apple and pear black spot [*Venturia inaequalis* and *V. pirina*, respectively], in New South Wales a spray of 0.1 per cent. sodium dinitro-ortho-cresylate [elgetol: *ibid.*, xxi, p. 494] applied at the rate of 400 gals. per acre at the green-tip stage to the leaf refuse lying in the orchard reduced the number of affected apples and pears by 47 and 83 per cent. respectively, as compared with the unsprayed blocks, while the number of spots per fruit on those that were spotted was also fewer in the treated than in the untreated blocks. 'A floor spray' is, however, regarded as only supplementary to the normal spray programme, and, further, must be made over an area of at least two acres, as the wind dispersal of the spores from the unsprayed areas would nullify the effect of the treatment if it were applied to a smaller area.

Brief notes are also given on cucurbit diseases and their control.

GARDNER (A. D.) & CHAIN (E.). **Proactinomycin: a 'bacteriostatic' produced by a species of Proactinomyces.**—*Brit. J. exp. Path.*, xxii, 3, pp. 123–127, 1942.

Proactinomycin, a substance produced by a species of *Proactinomyces* Waksman, occurring as a contaminant of bacterial cultures at the Sir William Dunn School of Pathology, Oxford, was shown to inhibit the growth of various bacteria, e.g., *Streptococcus pneumoniae* (types 13 and 22) at a dilution of 1 in 1,500,000. In comparison with penicillin proactinomycin has the disadvantage of much greater toxicity (in tests on mice and human leucocytes), but, on the other hand, it is more stable and chemically more amenable.

WAKSMAN (S. A.), HORNING (ELIZABETH S.), & SPENCER (E. L.). **The production of two antibacterial substances, fumigacin and clavacin.**—*Science*, N.S., xevi, 2487, pp. 202–203, 1942.

In a study of the presence of antagonistic fungi in nature, two species of *Aspergillus*, *A. fumigatus* (16 strains from soils) and *A. clavatus* (three strains from stable manure), were found to produce active substances, designated fumigacin and clavacin, respec-

tively, which differed greatly in their chemical nature and biological activity. Fumigacin is particularly active against Gram-positive bacteria and clavacin against Gram-negative. The substance recently isolated by Wiesner from *A. clavatus* [*R.A.M.*, xxi, p. 283] appears to be similar to, if not identical with, clavacin.

PAVLOFF (K.). **Wheat No. 11—agronomic and botanical description.**—*Rev. Inst. Rech. agron. Bulg.*, ix, 4, pp. 45–78, 1939. [Abs. in *Plant Breed. Abstr.*, xiii, 1, pp. 34–35, 1943.]

The new wheat No. 11, which is stated to be widely grown in south-western Bulgaria, where the crop is assuming increased importance in comparison with rye and rye-wheat mixtures, has been found by [D. N.] Dodoff to be highly resistant to two out of the three physiologic races of *Puccinia glumarum* recorded in the country [*R.A.M.*, xviii, p. 734] and susceptible to the third, as well as to all 12 races of *P. triticina* recognized in Bulgaria [ibid., xvii, p. 226]. The variety is resistant to five, and moderately so to one, of the 13 races of *P. graminis* found in the country, but highly susceptible to the remaining seven. Under field conditions No. 11 shows a fair degree of resistance to *P. graminis* and *P. glumarum* and is free from infection by *Ustilago tritici*, but its susceptibility both to *P. triticina* and *Tilletia* species [*T. caries* and *T. foetida*] is appreciable. Notes are also given on the reaction of other wheat selections to the foregoing fungi.

МОУРАШКИНСКИЙ (K. E.). О качестве воды при термическом обеззараживании семян. [On the quality of water used in heat disinfection of seed].—*Ex K* весеннему севу 1942 года. Сборник статей. [On the occasion of spring sowing in 1942. Collection of papers], pp. 29–32, Издат. Наркомзема СССР. [Publ. Off. People's Comm. Agric. U.S.S.R.], Omsk, 1942.

It is pointed out that the majority of the installations for hot-water treatment of cereal seed-grain in the Soviet Union are operated in such a way that both the pre-soaking and the actual heating of seed-grain is made repeatedly in one and the same water, usually changed only once in 24 hours. By the end of the day the water is very alkaline, the colour of strong tea, and emits a penetrating smell of decay. The results of two experiments in which the seed-grain was treated in fresh or stale water showed that the emergence and the intensity of growth of seedlings in the first few days was impaired when the water was not changed after each operation.

MACHACEK (J. E.) & WALLACE (H. A. H.). **Non-sterile soil as a medium for tests of seed germination and seed-borne disease in cereals.**—*Canad. J. Res.*, Sect. C, xx, 11, pp. 539–557, 1942.

In greenhouse experiments conducted in Canada from 1939 to 1941 [cf. *R.A.M.*, xxi, p. 366] non-sterile soil was found to be a very satisfactory medium for testing seed germinability and certain seed-borne diseases of cereals, offering at the same time more resemblance to the natural conditions obtaining in the field than most other tests. The best results were obtained with a friable sand-soil mixture kept moderately moist and at a temperature of 20° C. This mixture did not become seriously depleted even after six months of continuous use and showed very little variability in the results obtained. In comparative tests for germinability, seed-borne disease, and physical injury with 120 different lots of seed, those in non-sterile soil gave equally good results with experiments in autoclaved soil, but had the advantage of being more easily handled and saving the time and labour involved in soil sterilization; they were on the whole comparable to tests on moist paper or on nutrient agar in Petri dishes, and were superior to both in measuring the amount of physical damage. With barley seed infected with *Helminthosporium teres* a plating test was necessary to indicate infection, but even this test apparently failed to differentiate between virulent and non-virulent strains of the fungus.

Tentative recommendations, based on tests in non-sterile soil with several thousand

seed lots, are given in tabular form. Seed disinfection with organic mercury dust is recommended where the spore load of smuts (covered smuts of wheat, oats, and barley, and loose smut of oats [*Tilletia caries* and *T. foetida*, *Ustilago kollerii*, *U. hordei*, and *U. avenae*, respectively]) exceeds 1:128,000 or where seed decay or seedling blight reduces the percentage of healthy seedlings from non-disinfected seed below 91; increases in rate of seeding are recommended when the percentage of healthy seedlings, even after seed disinfection, is less than 91 but more than 50 per cent.; seed germinating 50 per cent. or less after disinfection should be discarded.

**HWANG (L.). The effect of light and temperature on the viability of urediospores of certain cereal rusts.**—*Phytopathology*, xxxii, 8, pp. 699–711, 1942.

A tabulated account is given of the writer's greenhouse experiments at St. Paul, Minnesota, to determine the effects of sunlight and temperature on uredospore viability in physiologic races 1 and 45 of *Puccinia coronata*, 11, 36, 38, and 56 of *P. graminis tritici*, 2 and 6 of *P. g. avenae*, *P. g. secalis*, and *P. rubigo-vera tritici* [*P. triticea*], the standardized methods of inoculation and incubation used being fully described.

The urediospores of *P. g. tritici* race 36 survived two days' exposure to a temperature of 44° C., and even after 60 hours, 8 per cent. germination was recorded, whereas after two days at 50°, only 1 per cent. were still viable, and at 60° more than half the spores were killed within four hours and nearly all were dead after 15. Under natural conditions in the Upper Mississippi Valley such high temperatures never obtain, though upwards of 40° is on record for Minnesôta.

In the sunlight-resistance trials, over 10 per cent. of the spores of *P. g. tritici* (races 38 and 56) withstood 270 hours' exposure to an intensity corresponding to that of 500 to 1,500 foot-candles, the viability of race 36 being more severely impaired (1 per cent. survival): at an intensity reaching a daily maximum of 7,000 foot-candles a minimum of 10 per cent. of the spores of all three races (28 in the case of 56) were still viable after 75 hours but none survived 270 and only a trace of germination was perceptible in race 56 after 175 hours, to which the other two succumbed. Under the intensive sunlight, sometimes exceeding the power of 10,000 foot-candles, of a June day in Minnesota, the survival period of the cereal rust urediospores may well be even shorter than indicated by the experimental data, which were similar for the other isolates included in the trials.

In order to determine the relative effects on the urediospores of different qualities of direct sunlight, colourless, red, and blue cellophane filters and black paper were used to cover the exposure dishes. In general, viability declined more rapidly under the colourless filter than under the other coverings, *P. g. secalis* being an exception to the rule and losing its germinability uniformly in each series. An important aspect of the rust epidemiology situation concerns the ability of the spores to survive periods of deposition on the leaves of their hosts pending the advent of suitable moisture conditions for germination and infection. The results of experiments on potted seedlings of the susceptible Marquis wheat with *P. g. tritici* 36 and *P. triticea* and the semi-resistant Anthony oats varieties with *P. coronata* indicated that, even after exposures of four days or longer, with 48 hours of direct sunlight, a high incidence of infection was secured within 10 to 12 days after the supply of adequate humidity for germination.

**HASSEBRAUK (K.). Mit Hilfe neuer Testsorten durchgeführte Untersuchungen über die physiologische Spezialisierung von *Puccinia triticea* Erikss.** [Studies on physiologic specialization in *Puccinia triticea* Erikss., carried out with the help of new test varieties.]—*Arb. biol. Anst. (Reichsanst., Berl., 23, pp. 37–51, 1940.* [Abs. in *Plant Breed. Abstr.*, xiii, 1, p. 31, 1943.]

The results of tests of the physiologic races of wheat brown rust (*Puccinia triticea*) on an extended range of differential hosts revealed the existence of composite groups [*R.A.M.*, xviii, p. 731]. By the use of the varieties Mette's Rauheizen, White Club

Spelt, Rüfenach 6, Red Tirol Spelt, Rottweiler Red Dinkel St. VI, Sicilian Dinkel, Svalöf's Sonnen I, Hildebrandt's White Victoria, Loosdorfer III, Köstlin's Hohenheim Hybrid, Jäger's Alb, Abundance Gold Coin (a), and Malakoff, 45 new physiologic races have been determined. In the author's opinion, the differential hosts most appropriate for use in one country are not necessarily the best for another, and he further considers that the complexity of *P. triticina* in respect of its biological specialization may unfit it for continued studies along these lines.

MEAD (H. W.). **Environmental relationships in a seed-borne disease of Barley caused by *Helminthosporium sativum* Pammel, King, and Bakke.**—*Canad. J. Res.*, Sect. C, xx, 11, pp. 525–538, 1942.

In further experiments on the disease of barley caused by *Helminthosporium sativum* [*R.A.M.*, xxii, p. 55] seedlings grown in the greenhouse or in field plots from infected seed were found to suffer greatest damage under conditions unfavourable to the host, such as high temperature combined with excessive moisture or low temperature with low moisture. The strongest plants and best stands from diseased seed were obtained at 15° to 18° C. in moist soil. The microflora of the soil had little influence on the disease. Packing of the soil caused a significant reduction in emergence and an increase in the amount of seedling blight and stunting. Fertilization with ammoniated superphosphate (2–19–0) caused an insignificant reduction in emergence due to increased pre-emergence blighting; fertilized seedlings were more severely infected, but those that survived grew more vigorously than unfertilized ones. The reduction of the oxygen content of a nutrient solution and of soil from 21 to 10 per cent. caused stunting of the seedlings and reduced the amount of infection, this being interpreted as a result of slower metabolism of both the host and the parasite. The raising of the carbon dioxide content in the atmosphere of the soil to 1·25 per cent. increased the amount of infection. It is concluded that infected barley seed should be sown in cool, moist, and well-aerated soil.

ADAIR (E. O.). **Arkansas Oat hybrid shows great promise. Extensive field trials prove De Soto has marked resistance to rust and smut in addition to being high-yielding strain.**—*Sth. Seedsman*, v, 8, pp. 7, 31, 1942. [Abs. in *Plant Breed. Abstr.*, xiii, 1, p. 37, 1943.]

The DeSoto oats variety, a cross between the Argentine Victoria and the winter-hardy Lee, is stated to combine resistance to crown rust [*Puccinia coronata*] and smut [*Ustilago avenae* and *U. kolleri*] with freedom from winter injury.

DILLON WESTON (W. A. R.) & TAYLOR (R. E.). **Observations on ergot in cereal crops.**—*J. agric. Sci.*, xxxii, 4, pp. 457–464, 2 pl., 1942.

Examination of the records of ergot (*Claviceps purpurea*) in cereals during the past 24 years in England indicated that the fungus occurs more commonly on rye than on wheat, while it is less frequently found on barley, and is even more rare on oats. A more detailed study of the records from 1939 to 1942 showed that the disease is most prevalent in the northern parts of the country; of 500 acres of rye surveyed in Suffolk and Norfolk in 1942, only 80 showed a trace of ergot. It has been observed on several occasions on Rivet wheat, and it has been recorded on Rivet and *Triticum vulgare* crosses; only one case has been found on oats.

The percentage by weight of ergot in the threshed grain of the barley crops examined ranged from 0·03 to 0·88 per cent., the alkaloidal content of the only sample assayed being 0·216 per cent., calculated as ergotoxin.

As the feeding of contaminated grain to cattle is undesirable, a cleaning method was devised; the barley was first soaked for three hours in water and the floating fraction removed by skimming; the water was then drained away and replaced by solutions of 14·5 to 17 per cent. sodium chloride or 16 to 19 per cent. potassium chloride, all floating material being again removed after successive stirrings. The solution was then drained

off, and the grain washed, dried, and weighed. The effect of the pre-soaking is to reduce loss of grain in the skimming considerably, without appreciable reduction in the amount of ergot removed. The sodium chloride treatment increased germination, while potassium chloride slightly reduced it.

PORTER (C. L.). **The effect of bacterial contamination upon the subsequent growth of fungi in the same medium.**—*Proc. Ind. Acad. Sci.*, xlix (1939), pp. 75–76, 1940.

Repeated tests at Purdue University, Indiana, indicated that a bacterium closely allied to *B[acillus] subtilis* is capable of producing substances in potato dextrose agar cultures which are sharply inhibitory both to *Fusarium moniliforme* [*Gibberella fujikuroi*] and *Diplodia zeae*. These products remain stable under exposure for half an hour to temperatures up to 250° F. Even after 30 minutes' sterilization at 15 lb. pressure, the contaminated substratum was unable to support the growth of the fungi under observation [cf. *R.A.M.*, iii, p. 471].

BEARD (D. F.). **Relative values of unrelated single crosses and an open-pollinated variety as testers of inbred lines of Corn.**—*Abstr. Doct. Diss. Ohio Univ.* 33, pp. 9–18, 1940. [Abs. in *Plant Breed. Abstr.*, xiii, 1, p. 40, 1943.]

Twenty-one crosses between seven inbred lines of maize and three test varieties, viz., one open-pollinated, Eichelberger Clarage, and two single crosses, 56 × Hy and 73 B × Mc 401, were studied in respect of smut [*Ustilago eae*] infection and four other characters, the conclusion being reached that single crosses are at least equal to open-pollinated varieties for testing inbreds, besides offering certain specific advantages due to their greater uniformity.

In a second series of trials susceptibility to *Diplodia zeae* was investigated in a number of inbreds and their single and top crosses. A correlation of +0.77 was observed between the susceptibility of inbreds and that of their respective top crosses, so that the degree of susceptibility of hybrid combinations may be forecast from the performance of the constituents inbreds. The ranking of the various inbreds with regard to susceptibility differed significantly according to the location of the test.

LUDBROOK (W. V.). **Top rot of Maize, Sweet Corn, and Sorghum.**—*J. Coun. sci. industr. Res. Aust.*, xv, 3, pp. 213–216, 1 pl. [between pp. 252–253], 1942.

During the past three seasons scattered maize, sweet corn, and sorghum plants in parts of Victoria, New South Wales, and, apparently, South Queensland, have shown a condition in which, in the month preceding tasselling, the immature uppermost leaves are dead, dry, and bleached. When the dead leaves are pulled out, the top of the stem generally also becomes detached. The stem apex, immature tassel, and bases of the topmost leaves are destroyed by a wet, soft rot which emits a characteristically offensive odour. If the stalk is split longitudinally, a grey or brownish water-soaked rot of the parenchyma is found descending from the apex. Apical growth becomes arrested, and no tassel or grain develops, but vigorous suckers are, as a rule, produced from the base. Sorghum plants often develop laterals from the node below the rotted area.

Numerous isolations during three seasons from affected maize, sweet corn, and sorghum gave several types of bacteria, sometimes in association with *Gibberella fujikuroi* var. *subglutinans*, the fungus occasionally occurring alone. Inoculation tests demonstrated that some of the bacteria were saprophytic and others weakly pathogenic, but one organism repeatedly gave rise to characteristic symptoms. It has not yet been identified. It is a minute, motile, Gram-negative rod, forming small, circular, yellowish-white, raised, glistening, slightly translucent to opaque colonies, with slightly crenulate margins, sometimes becoming amoeboid in old, widely spaced colonies; liquefying gelatine rapidly in plates, and slowly, from the surface down, in stab cultures; forming acid and gas with sucrose, mannite, and dextrose, but not with lactose or maltose; coagulating litmus milk without acidification; forming little or no

indol; and reducing nitrate to nitrite: it rapidly rotted slices of potato, onion, carrot, tobacco stem, and cucumber. This isolate showed a marked decline in pathogenicity when maintained in culture and it is thought that some of the other organisms may be pathogenic when freshly isolated.

According to local growers the condition is probably favoured by careless harrowing or scarifying of seedlings, submergence of the plants for a few hours by flood, and grub injury.

NOTINI (G.) **Grönmykosen som bekämpningsmedel.** [Green mycoses as insecticides.] —*Växtskyddsnotiser, Växtskyddsanst., Stockh.*, vi, 2, pp. 29–32, 2 figs., 1942.

In a comparative experiment at a market-garden near Stockholm, where the larvae of the grain Noctuid *Agrotis* [*Euxoa*] *segetum* were troublesome, applications of arsenic dust, pyrethrin, and conidial suspensions of *Metarrhizium anisopliae* [*R.A.M.*, xviii, p. 380], resulted in a mortality of 0, 23, and 80 per cent., respectively. The lethal effects of the fungus were still apparent in the cold frames a year after inoculation.

DEY (N. C.) & MAPLESTONE (P. A.). ***Tinea imbricata* in India.**—*Indian med. Gaz.*, lxxvii, 1, pp. 5–6, 1942.

The results of the authors' studies on five cases of *tinea imbricata* in Assam confirms the supposition of Acton and Ghosh that the disease is due to *Endodermophyton indicum* [*Trichophyton concentricum*: *R.A.M.*, xiv, p. 35], of which *E. [T.] castellanii*, *E. [T.] tropicale*, and *E. mansonii* are regarded as synonyms. The contention of the previous investigators that the genus *Endodermophyton* should be merged in *Achorion* is also upheld.

EDGECOMBE (A. E.). ***Trichophyton purpureum* (Bang) and *Trichophyton gypseum* (Bodin): differentiation in culture.**—*Arch. Derm. Syph., Chicago*, xlii, 5, pp. 651–660, 2 figs., 1942.

In comparative studies at the College of Physicians and Surgeons, Columbia University, New York, on 20 strains of *Trichophyton purpureum* and 15 of *T. gypseum*, potato agar proved to be the best of seven culture media tested for differential purposes. A downy-looking surface with a white or pinkish colour above and the consistent development of a dark reddish-purple pigment in the submerged portion were characteristic of *T. purpureum*, while *T. gypseum* formed powdery colonies, white to cream above and the lower part uniformly occupied by a dull salmon-coloured pigment. Exposed to filtered ultra-violet rays, young cultures of *T. purpureum* exhibited a clear, pale blue fluorescence, whereas that emitted by *T. gypseum* was of a purple-violet tone.

In microscopic culture mounts the strains of *T. purpureum* were invariably devoid of spiral elements and formed elongate to piriform microconidia, 5 by 3  $\mu$ , and cylindrical, 2- to 10-septate, parallel-sided macroconidia, 60 by 6  $\mu$ . *T. gypseum* produced an abundance of spiral elements on potato and maize meal agars, oval to piriform microconidia, 3.5 by 2.5  $\mu$ , and clavate or piriform to cylindrical, 4- to 8-septate macroconidia, 45 by 8  $\mu$ .

**Indian Central Jute Committee. Annual Report of the Agricultural Research Scheme for the year 1940–41.**—56 pp., 5 pl., 1941.

Section VII of this report (pp. 31–39) presents the following information on jute diseases in India [*R.A.M.*, xx, p. 166]. Observations on 50 one-month-old plants attacked by stem rot (*Macrophomina phaseoli*) in the field showed that infection originated at the leaf margin and apex, whence it proceeded through the midrib to the petiole and finally to the nodal region of the stem. Rapid spread of foliar infections, involving necrosis of the entire leaf under favourable (very wet) weather conditions, took place between 18th and 25th June. The diseased leaves persisting on the stem left a discoloured patch, up to 2 to 2½ in. long, at the point of contact. The lesions

coalesce into long streaks in which, at an advanced stage, shredding of the epidermis and cuticle takes place. Adventitious terminal roots are produced at the ends of the streaks. Generally speaking, stem rot was much more prevalent in Eastern Bengal during the period under review than in 1939 to 1940, especially in upland crops. In two areas of the Dacca district a virulent and widespread epidemic of atypical form first observed three or four years ago and affecting 10 to 50 per cent. of the stands occurred during August. The formation of a number of coalescent cankers leads to rupture of the epidermal tissues and the breaking-off of diseased plants at the site of invasion. Neither sclerotia nor pycnidia could be detected on the rotted stems, isolations from which, however, yielded typical cultures of *M. phaseoli*.

Although none of the 49 varieties tested gave any indication of true immunity from stem rot, there is some possibility of obtaining resistant selections from *C[orchorus] capsularis* types such as D.154×27, Kalichar, and Barapat Rd. U. F. 2-06, while *C. olitorius* R.26 may likewise provide a useful parental stock. The comparative tolerance of the *olitorius*, as opposed to the *capsularis*, group of jute varieties is attributed to the slow progress of *M. phaseoli* in the leaves of the former, which drop off before invasion is completed, thereby saving the stem from attack. Twenty-day-old seedlings, dipped in a suspension of a stem-rot culture and transplanted in sterilized soil, developed typical damping-off symptoms. 85 per cent. of those inoculated succumbing to the disease and yielding *M. phaseoli* on reisolation. Negative results were given by similar tests on plants of 2½ months, and variable data were obtained in the case of one-month-old seedlings transplanted in infested soil. Only localized infection occurred on *C. acutangularis* plants inoculated through wounds in the branches.

A reasonable reduction in the incidence of stem rot, without appreciable impairment of germination, was secured by seven minutes' immersion of the seed in water heated to 58° C., ten at 57°, or 20 at 56°. The addition of two drops of 10 per cent. Castile soap per 10 c.c. water facilitated the evacuation of air under a water pump, thereby avoiding the need for pre-soaking of the seed and enabling it to withstand 15 minutes' treatment at a temperature range of 30° to 57°, beyond which point viability began to decline and fell markedly at upwards of 63°. From 40° onwards there was a gradual reduction in stem rot, but even at 70° a few (0.3 per cent.) seedlings were still affected, while at 63° the incidence of infection amounted to 5 per cent.

The best-yielding fertilizer treatment, consisting of nitrogen, potash, and lime, resulted in a reduction of stem rot and an increase of chlorosis, the latter, however, being without appreciable effect on output. The D.386×R.85 and D.154×D.27 selections are comparatively resistant to chlorosis and the second also to stem rot.

*Sclerotium rolfsii* was isolated from flowering or capsule-bearing jute plants suffering from a collar rot causing shredding and desiccation of the epidermal and cortical tissues and collapse of the stems.

A species of *Phomopsis* was identified by the Imperial Mycologist as the agent of black, oval, necrotic, sometimes coalescent lesions on the stems of mature plants. In the rotted fibres periderm was observed to persist at the site of the spots.

GRUMBACH (H.). **Auch der Lein muss gebeizt werden!** [Flax must be treated too!]  
*Kranke Pflanze*, xix, 3-4, p. 37, 1942.

The results of experiments reported in *NachrBl. deutsch. PflSchutzDienst*, xxii, 2, 1942, showed that the application to flax seed of a fungicidal dust not only effectively combated the seed-borne pathogens, *Fusarium [lini]*, *Botrytis [cinerea]*, and *Colletotrichum [lini]*, but exerted a stimulatory action on germination. The control plots yielded 736 healthy and 622 diseased plants and those treated at the rate of 200 gm. dust per 100 kg. seed 1,614 and 17, respectively. In similar tests at the Dresden Technical College in 1941, only 2 per cent. diseased plants were counted in the plots treated with an approved dust, e.g., abavit, ceresan, fusariol, or germisan, as against 22 per cent. among the controls. The treatment further tended to increase the strength of the fibres.

SCHÖNLEBER (KLARA). **Die Zerstörung von Flockenflachsfasern durch Bakterien und Pilze.** [The destruction of carded Flax fibres by bacteria and fungi.]—*Bastfaser*, ii, pp. 86–91, 1942. [Abs. in *Chem. Zbl.*, cxiii (ii), 16, pp. 1865–1866, 1942.]

Fungi predominated over bacteria in the enzymatic disorganization of carded flax fibres in the writer's studies at the Kaiser Wilhelm Institute for Bast Fibre Research, Sorau, Lausitz, Germany, one species of *Penicillium* in particular being responsible for a striking vinous and bluish-purple discoloration and the partial to complete destruction of individual fibres [cf. *R.A.M.*, xxi, p. 453]. Accurate observation of the damage was facilitated by the use of chlor-zinc iodine and of hanging-drop nutrient solutions.

MACHACEK (J. E.) & BROWN (A. M.). **Preliminary investigations on mechanical injury in Flax seed.**—*Phytopathology*, xxxii, 8, pp. 733–734, 1942.

Cracking of flax seed due to mechanical injury in threshing operations was very severe in Western Canada in 1940, reducing germination by about half, the damage thus induced being apparently similar to that described by Stevens (*J. agric. Res.*, li, pp. 1093–1106, 1935) and Härtel (*C. R. Ass. int. Ess. Sem.*, ii, pp. 213–223, 1936) from the United States and Germany, respectively. In greenhouse tests the rotting of cracked seeds was completely prevented by dusting with ceresan or half-ounce leytosan at the rates of 1½ and 2 oz. per bush, respectively, the average germination of 362 samples collected in 1940–1 being about doubled by the treatment. In field experiments on Redwing seed at Winnipeg and Morden, Manitoba, treatment with ceresan raised the yield from cracked samples to the level of that from undamaged ones.

BJÖRLING (K.). **Undersökningar rörande Klöverrötan. II. Studier av utvecklingshistoria och variation hos *Sclerotinia trifoliorum*.** [Investigations relating to Clover rot. II. Studies on the life-history and variation of *Sclerotinia trifoliorum*.]—*Medd. Växtskyddsanst., Stockh.*, 37, 154 pp., 148 figs., 1942. [German summary.]

Continuing his studies on the causal organism of clover rot (*Sclerotinia trifoliorum*) [*R.A.M.*, xviii, p. 684], the author found that the development and anatomy of the sclerotia agree in the main with the facts already observed in connexion with *S. sclerotiorum* [ibid., viii, p. 607]. Apothecial production was experimentally shown to be strongly influenced by environmental conditions, especially temperature and light. Two distinct processes are involved in the development from the apothecia of the haploid mycelium and the dicaryophase, the former taking place in darkness, whereas the latter requires a certain amount of light. The ascogenous hyphae are two kinds: primary without clamp-connexions and secondary with them, nuclear and cellular division in the latter proceeding in the same manner as among the higher Autobasidiomycetes. Comparative studies on *S. sclerotiorum* and *S. borealis* [see next abstract] showed the cytology of all three species to be essentially analogous [cf. ibid., xvi, p. 160; xix, p. 559]. *S. sclerotiorum* appeared to possess six chromosomes.

The enhanced virulence of the pathogen during the autumn and winter, that is to say, within a temperature range significantly below its optimum, is attributed less to a decline in the vitality of the host than to a plentiful access of inoculum and, more particularly, to the higher relative humidity.

The culture of different biotypes of *S. trifoliorum* on the same agar plate resulted in the formation of white lines of microconidia in the zones of contact. From a detailed analysis of the abundant material at his disposal, the author concludes that the fungus consists of a number of physiologically dissimilar races, which are, however, often almost indistinguishable or identical in their morphological characters. These biotypes are self-fertile and, as a rule, homocaryotic. Hybridization between different races led to the production of heterocaryotic sclerotia and apothecia, the spore progeny of which was analysed and shown to be exclusively composed of new biotypes, the parent races not being represented in any of the tests. This phenomenon is interpreted as an effect

of heterosis, of some importance as a means of increasing variation within the species and undoubtedly affording scope for the development of new pathogenic races.

A brief discussion of the bearing of these observations on breeding clover for resistance to *S. trifoliorum* is given.

EKSTRAND (H.). **Årets vinterskador på höstsäd och vallar.** [The year's winter injury to autumn cereals and grasses.]-*Växtskyddsnotiser, Växtskyddsanst., Stockh.*, vi, 3, pp. 38-42, 3 figs., 1942.

In the south-east of Sweden the snow mould (*Fusarium*) [*Calonectria graminicola*] and *Typhula borealis* [*R.A.M.*, xx, p. 252] were chiefly responsible for winter injury to rye in 1941-2. In the north, on the other hand, and in the rye-growing district round Kristianstad, *C. graminicola*, usually abundant, was almost entirely absent, its place being taken by *Sclerotinia borealis* [loc. cit.]. *S. trifoliorum* [see preceding abstract] caused little damage to clovers except in a few localities, mostly those in which the snow mould was prevalent.

DREGNE (H. E.) & POWERS (W. L.). **Boron fertilization of Alfalfa and other legumes in Oregon.**-*J. Amer. Soc. Agron.*, xxxiv, 10, pp. 902-912, 3 figs., 1 graph, 1 map, 1942.

The results of plant and soil analyses in the Willamette Valley, Oregon, indicate that a normal level of boron in lucerne is of the order of 20 p.p.m., and that 1 p.p.m. available in the surface soil should suffice to prevent the development of 'yellow top' [*R.A.M.*, xxi, p. 494] and give satisfactory yields. Sandy peat and aged leached soils are lowest in boron content and therefore respond most readily to treatment with borax or boric acid at the rates of 30 to 60 lb. per acre and two-thirds that amount, respectively, a 30 lb. application of borax remaining effective for about three years. The best times for the use of the fertilizer are autumn in the arid section and early spring in the humid region of the State.

SPRAGUE (R.). **Cercospora eyespot of Kentucky Bluegrass.**-*Phytopathology*, xxxii, 8, pp. 737-738, 1 fig., 1942.

*Cercospora poagensis* n. sp., the agent of an 'eye spot' of Kentucky bluegrass (*Poa pratensis*) in the Willamette Valley, Oregon, is characterized by hyaline conidiophores and hyaline, elongated, broadly filiform to obclavulate, 4 to 7 (mostly 4)-septate conidia, 45 to 90 by 3.6 to 5 (45 to 75 by 3.6 to 4.6 in the type)  $\mu$ , with blunt, tapering bases and abruptly acuminate or attenuated apices. The lesions produced by *C. poagensis* on the leaves of its host are circular to elongated, light brown, with a straw-coloured centre and yellowish border, and are therefore quite distinct from the ashy to stramineous, pycnidia-bearing spots associated with *Septoria macropoda* Pass. var. *septulata* (Gz. Frag.) comb. nov. (*S. poae-annuae* var. *septulata* Gz. Frag.), and those due to *Helminthosporium vagans*, which have dark to nearly black centres (sometimes turning lighter) and prominent, reddish-brown borders. Evidence obtained while making comparative studies on *C. poagensis* indicated that *Napicladium gramineum* Peck and, in the opinion of Chupp, probably *Cercospora poae* Baudyš & Pieb. are synonyms of *Scolecotrichum graminis* [*R.A.M.*, xviii, p. 587].

NEGRONI (P.) & FISCHER (IDA). **Estudio micológico de treinta cepas de Pullularia (Dematium) pullulans.** [A mycological study of 30 strains of *Pullularia* (*Dematium*) *pullulans*.]-*Rev. Inst. bact., B. Aires*, xi, 1, pp. 99-108, 7 pl., 1942. [English and French summaries.]

The physiological characters of the 30 strains of *Pullularia pullulans* from fruit, leaves, and air studied in pure culture on beer wort agar and other standard media were remarkably uniform, and the slight morphological differences between them are not regarded as sufficiently important to justify specific or varietal distinctions. In general,

the colonies are black, folded, moist, and glistening. The hyaline, elliptical blastospores measure 2 to 14 by 1.5 to 5.6 (average 7 by 3 to 3.5)  $\mu$  and arise from the hyaline, septate, branched mycelium in two ways, (a) by budding and (b) on small pedicels (pseudoconidial type); they are disposed round the hyphae like a small cuff, three or four cell layers in thickness (*Rhinocladium* type) [*R.A.M.*, ix, p. 246], often forming clusters (*Mycotoruloides* or *Mycotorula*) or branched lateral or terminal chains (*Mycocandida*) [*ibid.*, xviii, p. 525]. At times several blastospores may be formed on the enlarged end of a short branch in a manner reminiscent of an *Aspergillus* head, or clusters of bacilli-form spores may be produced. Other organs produced by the mycelium include arthrospores and hyaline or fuliginous chlamydospores of the dictyospore, bulbil, or nodular organ type, the last-named sometimes bearing peripheral blastospores resembling those of *Sarcinomyces*.

The optimum growth temperature was about 23° C. Dextrose, maltose, lactose, raffinose, and a small amount of galactose were utilized as sources of carbon, while nitrogen was supplied by peptone, asparagin, ammonium sulphate, potassium nitrate, and (to a slight extent) urea. Milk was coagulated and peptonized and gelatine liquefied. The systematic position of *P. pullulans* is considered to be among the Fungi Imperfecti (Hyphomycetes), order Thalosporales Vuill., 1910, sub-order Blastoarthrosporineae Puntoni, 1938, family Trichosporaceae Nannizzi, 1931.

FISHER (D. F.). **Handling Apples from tree to table.**—*Circ. U.S. Dep. Agric.* 659, 39 pp., 17 figs., 1 graph, 1942.

Included in this useful summary of the correct methods of handling apples to insure their prime condition on arrival in the American market are notes on the factors conducive to the development of fungal diseases, notably blue mould (*Penicillium expansum*) and physiological disorders, e.g., bitter pit, Jonathan spot, water core, internal breakdown, soft scald and soggy breakdown, and scald, and on the means of obviating or combating these defects.

MONTGOMERY (H. B. S.) & SHAW (H.). **Laboratory tests of bactericides on the Plum and Cherry bacterial canker organism (*Pseudomonas mors-prunorum* Wormald).**  
I. The toxicity of some inorganic materials, especially copper compounds, and the effect of hydrogen ion concentration on the organism.—*Ann. appl. Biol.*, xxix, 4, pp. 399–403, 1942.

In laboratory tests conducted at East Malling in 1939 the toxicity of 29 metals used in the form of soluble salts (mostly nitrates, otherwise chlorides) to *Pseudomonas mors-prunorum* [*R.A.M.*, xxi, p. 25] was determined as follows. Mercury, silver, gold, uranium, and copper, in descending order, were found to be the most toxic of the materials tested. The toxicity of both soluble and insoluble copper salts varied to an extent that could not be explained by differences in hydrogen-ion concentration, but the outstanding activity of Bordeaux mixture was found to be due to the alkalinity produced by the lime component. The limits of tolerance of the organism to hydrogen-ion concentration was about  $P_H$  3.2 to 10.4.

ARCHIBALD (E.) & WANN (F. B.). **The zinc content of 'little leaf' and normal leaves.**—*Abs. in Amer. J. Bot.*, xxix, 8, p. 694, 1942.

In a paper read before the Pacific section of the Botanical Society of America at a meeting held at Salt Lake City, Utah, 15th to 18th June, 1942, the authors stated that fruit trees in certain parts of Utah are seriously affected by little leaf, but that zinc sulphate applied as a foliage spray gave good control [cf. *R.A.M.*, xx, pp. 449, 479]. Chemical analysis in diseased and healthy peach, cherry, apple, and plum leaves revealed little or no transverse movement of zinc in the plant, and a higher zinc content in leaves sprayed with zinc sulphate than in those treated by any other control method. The zinc content of the leaves was not increased by zinc soil treatments. Little-leaf

symptoms developed on trees with less than 123 microgm. zinc per gm. of dry matter, whereas healthy leaves contained 123 to 345 microgm.

FAHEY (J. E.). **Compatibility of copper fungicides with nicotine bentonite insecticides.**—*J. econ. Ent.*, xxxv, 4, pp. 517–520, 1942.

The effect of copper fungicides and nicotine-bentonite insecticides on the water-soluble nicotine and water-soluble copper contents of the water phase of spray mixtures prepared from these materials was studied in the laboratory of the Bureau of Entomology and Plant Quarantine, United States Department of Agriculture. The total copper percentage in 17 copper fungicides ranged from 6.5 to 56 per cent., the latter occurring in basic cupric carbonate, the corresponding figures for basic copper sulphate, red cuprous oxide, copper oxychloride, and copper phosphate being 50.8, 49.9, 48.2, and 45.3, respectively. Preliminary tests showed that a  $\frac{1}{32}$ – $\frac{1}{16}$ –100 Bordeaux mixture exerts a measurable effect on the water-soluble nicotine content of the insecticides. Copper fungicides producing strongly alkaline spray mixtures (above  $P_H$  8.5) above or in combination with nicotine-bentonite insecticides, will result in a large increase in the soluble nicotine content of the latter. The soluble copper content of the fungicides was increased by factory-processed and reduced by unaltered bentonite in the insecticides.

PARKER-RHODES (A. F.). **Studies on the mechanism of fungicidal action. IV. Mercury.**—*Ann. appl. Biol.*, xxix, 4, pp. 404–411, 1942.

The theory of variability, formulated in an earlier contribution to this series [*R.A.M.*, xxi, p. 422], was applied to dosage-mortality figures obtained for two fungi (*Macrosporium* [*Stemphylium*] *sarciniforme* and *Botrytis allii*) and one bacterium (*Bacillus agri*), derived from a culture obtained from the National Collection of Type Cultures in 1940) with a representative range of mercury compounds. From the estimates of the variability of the spores and cells to the various toxins used it is concluded that *S. sarciniforme* can absorb all the mercuric compounds tested, but requires the molecule of mercurous chloride to be dissociated to the metal and the mercuric salt before it can be absorbed; that *Botrytis allii* differs in being unable to absorb the methyl-mercuric ion in its native state; and that *Bacillus agri* cannot absorb mercury except in the form of its chloride, and possibly other combined forms which are produced under the influence of the diffusate from the cells. The term 'absorption' is here used as including adsorption as well as actual permeation. It is believed that in the present experiments the toxic effects against the bacterium were of bactericidal rather than bacteriostatic nature. Of all the compounds tested methylmercuric nitrate was the most toxic to the fungi (although the effect was less marked in the case of *Botrytis allii*) as well as to the bacterium.

GHESELE (E. E.). Основы фитопатологической оценки в селекции. [The basis of phytopathological evaluation in selection.]—120 pp., 10 figs., 5 graphs, Госуд. Издат. колл.-совх. Литер. "Сельхозгиз" [State Publ. Off. Lit. collect. co-op. Farming 'Selkhozgiz'], Moscow, 1941.

This text-book on plant breeding for resistance to disease is composed of eight chapters, the first three of which deal, respectively, with the biological specialization, the physiologic races of parasitic fungi, and the mechanism of infection and resistance in the host plant; and the remainder with the standards of comparative tests, methods of artificial infection, and criteria for the evaluation of results.

MÜHLE (E.). **Kartei für Pflanzenschutz und Schädlingsbekämpfung: 1. Lieferung, 1942, 42 Karteikarten.** [Chart for plant protection and pest control. Part 1, 1942, 42 chart cards.]—Leipzig, S. Hirtel, R.M. 3.60. [Abs. in *Z. PflKrankh.*, lii, 9–10, pp. 455–456, 1942.]

The first part of this series of plant protection and pest control cards, of which 10 to

12 parts, comprising 400 to 500 pages, are planned for future publication, deals with the diseases and pests of the Gramineae, with special reference to fodder grasses. The aim of the work is to provide for each crop an identification table on the symptoms of the various disorders, cards for each pest and disease indicating the incidence, extent, effects, appearance, life-history, and control of the various pathogens; synopsis cards, supplying keys for the ready differentiation of closely related parasites and information on general matters of plant protection; and index cards to facilitate reference to individual pathogens under their various designations. From time to time a given card may be superseded by a new one incorporating the results of recent research.

BRYSON (H. C.). **Fungal attack on glyptal resins.**—*Plastics*, v, 46, p. 43, 1 fig., 1941.

Fungal infection has been found to constitute an important cause of the breakdown of the glyptal resin (glycerine and phthalic anhydride) films widely used in the paint industry, the small, hard, black spots commonly observed on the surface being desiccated moulds. In the writer's experiments in England (Scott, Bader & Co., Ltd.), (a) six blocks of wood were varnished with a solution of glyptal resin (synolac S.B. 148), (b) six with synolac plus 0.33 per cent. of a 33 per cent. solution of zinc mercury naphthenate, (c) six with synolac plus 0.66 per cent. by weight of a 33 per cent. solution of zinc mercury naphthenate, and (d) six with synolac plus 3.3 per cent. of a 33 per cent. solution of zinc mercury naphthenate. Synolac S.B. 148 is a linseed-tung oil-modified glycerolphthalic anhydride resin containing 48 per cent. combined fatty acid, the solvent being decalin and the drier 1.3 per cent. of a 50 per cent. solution in white spirit of a cobalt naphthenate. The four lots of samples were inoculated with a mixture of *Penicillium* and *Cladosporium* spores and incubated for five months at 18° to 30° C. Lot (a) contracted severe infection over the entire surface, (b) sustained only slight damage, (c) was barely touched, while (d) remained completely free from fungal invasion.

TURNER (M. B.). **Mold problems of the paint industry.**—*Amer. Paint J.*, xxvi, 25, pp. 18-24, 1942. [Abs. in *Paint Tech.*, vii, 78, p. 96, 1942.]

The growth of unspecified moulds on paint is influenced by the physical characteristics of the film and the conditions of exposure, and identification may be difficult when the fungus occurs as a uniformly distributed spotting or in the form of individual colours. The requirements of fungicides for paints are discussed. Among the chemicals that have given promising results in laboratory tests are organic mercury compounds, organic and inorganic copper compounds, and chlorinated phenols, tetrachlorophenol being the most satisfactory [*R.A.M.*, xxi, p. 498]. It is soluble in paint oils and can either be incorporated with the pigment during grinding or dissolved in the thinners. Tetrachlorophenol possesses optimum water solubility both for fungicidal efficacy and film durability, and a 2 to 3 per cent. concentration prevents mould development under all conditions of exposure.

MRÁK (E. M.), PHAFF (H. J.), & DOUGLAS (H. C.). **A sporulation stock medium for yeasts and other fungi.**—*Science*, N.S., xcvi, 2497, p. 432, 1942.

Good sporulation with several hundred yeast cultures belonging to 14 genera (including *Debaryomyces* and *Nematospora*) has been obtained in seven days or under on a medium made by grinding equal weights of washed, unpeeled carrot, beet, cucumber, and potato, and mixing with a quantity of water equal to the weight of the vegetables. The mixture was autoclaved at 10 lb. pressure for 10 minutes, after which the extract was separated from the solid part by the use of cheese-cloth and pressure. The  $P_H$  value of the extract was about 5.7 and the Balling degree about 4. Two per cent. agar was added, and slants were made. The sterilization advised is 15 lb. for 15 minutes. Certain other fungi also showed a strong tendency to produce conidia on this medium.

GRAINGER (MARY). **Some chemical aspects of the fungi.**—*Naturalist, Leeds*, 803, pp. 153, 158, 1942.

After presenting a table showing the presence or absence of the most usual constituents of other plants in a number of common fungi, the author discusses from a chemical standpoint the nature of the cell walls in fungi, the effect of seasonal factors on nitrogen nutrition, useful products obtained from fungi (e.g., penicillin), poisons produced by these organisms, and the value of fungi as food.

The edible fungi *Boletus edulis*, *Lactarius deliciosus*, *Claviceps purpurea*, and *Hygrophorus conicus*, with negative haemolytic and low nucleolytic activity, show a zinc content of 74, 86, 90, and 136.6 mg. per kg. dry matter, respectively, as against 167, 202, and 211 for the poisonous fungi *Amanita muscaria*, *A. pantherina*, and *Russula emetica*, respectively, which show a positive haemolytic and a high nucleolytic activity. From this it is concluded that the toxic properties of fungi, as shown by the ability to attack red blood corpuscles or cell nuclei, run parallel with a high zinc content. In this connexion it is pointed out that ergot, which is not too poisonous to be taken internally, is obtained from *C. purpurea*, the zinc content of which is nearer the range of the edible than of the poisonous fungi.

TOMLINSON (T. G.). **Some aspects of microbiology in the treatment of sewage.**—*J. Soc. chem. Ind., Lond.*, lxi, 4, pp. 53–58, 14 figs., 1 graph, 1942.

The following fungi occurring in experimental filters treating sewage by single and alternating double filtration at the Minworth works of the Birmingham Tame and Rea District Drainage Board are described: *Fusarium aqueductum*, the conidial stage of *Nectria episphaeria*, producing a conspicuous orange growth on the surface of sewage, milk factory, and beet sugar factory waste water-treating filters; a fungus provisionally identified by E. W. Mason, of the Imperial Mycological Institute, as an undescribed species of *Sepedonium*; *Oospora* spp., found only beneath the surface in association with the *Sepedonium*, except during the winter, when they form part of large fungal mats on the surface of the single filter; and a species of *Phoma* apparently initiating the fungal colonization of new filters, its pycnidia sometimes being visible as minute, black spots on the surface of the filtering medium. The *Sepedonium*, which is characterized by regular, branched, septate hyphae up to  $16\mu$  in width, and spherical, brown, terminal, lateral, or intercalary chlamydospores, is perhaps the most important of the Minworth sewage moulds, its mycelium growing profusely on or below the filter surface during the colder months of the year.

An experiment is described in which it was found that on the surface of a double filter in the presence or absence of light, *F. aqueductum* was predominant under the former, and *Oospora* under the latter conditions. The *Fusarium* successfully competed in the light with *Stigeoclonium* and *Chlorella*, by which the *Oospora*, on the other hand, was overgrown. Apart from this competition, decomposition of fungal mycelium in the secondary filter was due to (a) starvation, and (b) bacterial invasion of the hyphae.

LEA (D. E.) & SMITH (K. M.). **The inactivation of plant viruses by radiations. II. The relation between inactivation dose and size of virus.**—*Parasitology*, xxxiv, 2, pp. 227–237, 3 graphs, 1942.

Continuing their investigations [*R.A.M.*, xx, p. 138] the authors describe further experiments on the inactivation of the viruses of tomato bushy stunt, tobacco necrosis, tobacco ring spot, tobacco mosaic, and potato virus X by gamma rays, X-rays, and alpha rays. The paper concludes with a hypothesis explaining the results obtained and correlating the inactivation dose with virus size.

LIHNELL (D.). **Coenococcum graniforme als Mykorrhizabildner von Waldbäumen.** [*Coenococcum graniforme* as a mycorrhiza-producer on forest trees.]—*Symb. bot. upsaliens.*, v, 2, 19 pp., 2 pl., 6 figs., 1942.

From four localities in Sweden and Denmark the writer collected the mycelium and sclerotia of *Coenococcum graniforme* [*R.A.M.*, xviii, p. 701]. The four isolates, which are morphologically closely similar, readily formed anastomoses in pure culture, a fact interpreted as an indication of near relationship. The fungus was shown by means of synthetic experiments to be capable of forming on *Pinus sylvestris*, spruce, birch (*Betula verrucosa*), aspen, and lime (*Tilia cordata*) mycorrhiza of the so-called 'Dn' type [*ibid.*, xix, p. 423], characterized by their black colour, profusely radiating, coarse, black hyphae, and reticulate mantle. Negative results were given by tests on juniper, *Salix caprea* and *S. repens*, and alder (*Alnus glutinosa*), but there is some evidence to suggest that mycorrhizal production by *C. graniforme* on these species is not excluded under conditions other than those selected for these trials.

The appearance and mode of growth of the mycelium of *C. graniforme*, its tendency to produce mycorrhiza on various kinds of forest trees, and the similarity of these formations to those of *Mycelium radicis nigrostrigosum* [*loc. cit.*] are considered to leave no doubt as to the identity of the two fungi. A basis for the discussion of the taxonomic status of *C. graniforme* may be afforded by the structural analogies between the hyphal mantles of the mycorrhiza in this species and the perithecial walls of the genus *Cephalotheca* (Plectascales).

MODESS (O.). **Zur Kenntnis der Mykorrhizabildner von Kiefer und Fichte.**—[A contribution to the knowledge of the mycorrhiza-producers of Pine and Spruce.]—*Symb. bot. upsaliens.*, v, 1, pp. 3-147, 3 pl., 1941. [Abs. in *Biol. Abstr.*, xvi, 8, p. 1865, 1942.]

This is an expanded version of the writer's studies of the synthesis between pine and spruce and pure cultures of 55 species of Gasteromycetes and Hymenomycetes, resulting in mycorrhizal formation, a preliminary note on which has already appeared [*R.A.M.*, xviii, p. 541]. *Pinus sylvestris*, *P. montana*, and *Picea abies* all formed mycorrhiza with *Amanita mappa*, *A. muscaria*, *A. pantherina*, *Boletus flavidus*, *Lactarius helvus*, *Tricholoma albobrunceum*, *T. imbricatum*, *T. pessundatum*, and *Scleroderma aurantium*. In addition, mycorrhiza were formed by *Pinus sylvestris* with *Entoloma rhodopolium*, *Psallium granulosum*, *T. vaccinum*, *Rhizopogon luteolus*, and *R. roseolus*; and by *Pinus montana* with *R. roseolus*, *A. rubescens*, *B. submontentosus*, and *L. rufus*. The hydrogen-ion relations of the mycorrhizal fungi were found to vary both in culture and in the field.

CRAIGIE (J. H.). **Heterothallism in the rust fungi and its significance.**—*Trans. roy. Soc. Can.*, 3rd Ser., xxxvi, Sect. v, pp. 19-40, 7 pl., 1942.

In this paper the author presents a comprehensive review of contributions to present knowledge of the rust fungi that have accumulated as a result of the discovery of heterothallism among these organisms. The points dealt with include experimental evidence of heterothallism, cytological investigations of heterothallism, the species that have so far been shown to be heterothallic, hybridization and progeny studies, intervarietal and interracial crosses, selfing, inheritance of pathogenicity and spore colour, and abnormalities resulting from inbreeding. A list of 79 references is appended.

ROBBINS (W. J.) & MA (ROBERTA). **Pimelic acid, biotin and certain fungi.**—*Science*, N.S., xcvi, 2496, pp. 406-407, 1942.

In experiments by the authors the addition of 0.05  $\mu$ gm. of biotin to a tube containing 8 ml. of the basal medium permitted luxuriant growth of *Ceratostomella ips* No. 255, *C. ips* No. 438, *C. microspora*, *C. montium*, *C. obscura*, *C. penicillata*, *C. pini*, *C. radicola*, *Grossmannia serpens* [*R.A.M.*, xv, p. 827], *Fusarium avenaceum*, *Neurospora*

*sitophila* 56·2, and *N. tetraspora* S, none of which made more than slight growth on a mineral-dextrose-asparagin medium without biotin. The synthesis of biotin by *Aspergillus niger* is said to be increased by the addition of pimelic acid to the medium, but the above-mentioned 12 fungi and *Nematospora gossypii* [ibid., xvii, p. 196], the organism used by Kögl as a means of bioassay in the original isolation of biotin, appeared under the experimental conditions to be unable to synthesize biotin from pimelic acid or from pimelic acid and *l*-cystine. The relation of micro-organisms to thiamin and its thiazole and pyrimidin intermediates have shown that some organisms have no synthetic power for thiamin, requiring it in molecular form; others have incomplete synthetic ability, and can construct the vitamin if given the requisite intermediates; while others, again, are able to make thiamin from the minerals and sugar in a basal medium. A similar situation may exist with regard to biotin, and if such is the case, the 13 fungi used in the authors' experiments would seem to require biotin as such.

COWIE (G. A.). **Factors inducing mineral-deficiency symptoms on the Potato plant.**—*Ann. appl. Biol.*, xxix, 4, pp. 333-340, 1 fig., 1942.

The following results were obtained in 24 replicated manurial trials made on the potato crop (mainly the Majestic variety) in widely spread localities from the north of Scotland to the south of England in 1937 and in 25 further trials of a different design in 1938. Leaf scorch and other typical potash deficiency symptoms on the aerial parts of potato plants were normally induced by treatment with nitrogen plus phosphate and not by nitrogen only, and the presence of leaf scorch on nitrogen plots was found to be correlated with a high level of available phosphates in the soil. An increase in the level of nitrogen in the nitrogen-phosphate treatment resulted in intensified potash-deficiency symptoms. It is concluded that some interaction between nitrogen and phosphates is the primary factor responsible for inducing potash-deficiency symptoms in the above-ground parts of potato plants. The blackening of cooked tubers [*R.A.M.*, xxi, p. 41] is believed to be due to a combination of high nitrogen with low potash levels in the soil. Phosphate-deficiency symptoms were induced by nitrogen, and, even more strongly, by nitrogen-potash treatments. Under conditions of low phosphates and low potash in the soil the nitrogen plants exhibited phosphate-deficiency and not potash-deficiency symptoms. Foliar symptoms of calcium deficiency were observed in three localities on poor sandy soils with  $P_{11}$  values below 5. No symptoms of magnesia deficiency were present in any locality and season, and there were no significant yield responses to magnesia with one exception in each year.

SHEFFIELD (F[ANCES] M. L.). **The 'blotches' on leaves of Arran Pilot Potatoes.**—*Ann. appl. Biol.*, xxix, 4, pp. 341-345, 2 pl., 1942.

The nature of the grey-green blotches or blisters sometimes observed at flowering time on leaves of the popular early potato variety Arran Pilot and occurring with varying degree of intensity from district to district and from season to season, although usually more intense in the west and north, was studied during 1941 at Harpenden. The blotches were found to be due to necrosis of the epidermis, followed by cell division in the palisade tissue to form several layers of small, thin-walled, colourless cells. This proliferation may occur on the top only or on both sides of the leaf, the new tissue partially masking the green of the older cells underneath. Soon after the blotches become visible externally, the tissues within them begin to degenerate and completely dry out after three to four weeks. The exact nature of the disorder, which is believed to be of genetic origin, has not been established.

DYKSTRA (T. P.). **Compilation of results in control of Potato ring rot in 1941.**—*Amer. Potato J.*, xix, 9, pp. 175-196, 1942.

This is the report of the 1941 survey of the committee appointed by the American

Potato Association for the stimulation and co-ordination of research on ring rot (*Phytophthora sepedonica*) [*Corynebacterium sepedonicum*] already noticed in part from another source [*R.A.M.*, xxi, p. 502].

Tests at the Wyoming Agricultural Experiment Station to ascertain the most reliable method of inoculation indicated that the introduction of an agar culture suspension through the sprouts with a hypodermic needle expedited the development of the symptoms, while the immersion of whole tubers in a bacterial suspension resulted in a later appearance and lower incidence of infection than in any of the other tests. The use of a contaminated cutting knife induced 100 per cent. infection by 4th September (tubers planted on 21st May), the corresponding figures for smearing on the cut surface with a diseased tuber, dipping cut and whole tubers in a bacterial suspension, and the hypodermic needle insertion being 98.3, 91.7, 70, and 97 per cent., respectively. At Beltsville, Maryland, the highest percentage of infection was obtained by the immersion of the cut surface in a bacterial suspension for 15 minutes, followed by immediate planting, and none by the hypodermic injection of a suspension of *C. sepedonicum* into shoots 8 to 10 in. high: satisfactory results were further secured by hypodermic inoculations 2 mm. from the 'eyes' of the seed pieces but not by dipping whole tubers in a suspension of the pathogen. The effect of different concentrations of the bacterial suspension in hypodermic inoculations through the 'eyes' was tested, using 40 plants in each of three series of which A was diluted with 5 c.c. water per agar slant, B with 10, and C with 20. The percentages of stalk and tuber infection in A, B, and C amounted to 45.6 and 1.7, 72 and 8.3, and 31.5 and 0, respectively.

In Wyoming no difference in the symptoms developing in plants inoculated by various methods with *C. sepedonicum* from eight different States could be detected. The average infection from 18- to 20-day-old cultures was 56 per cent. compared with only 12 per cent. from 40-day-old cultures. The application of smears from diseased tubers to the cut surfaces and needle-stab inoculations through the 'eyes' gave 100 per cent. infection.

At Beltsville a modified potato dextrose medium was found to be the most suitable for the growth of *C. sepedonicum*; it consists of 300 gm. pared and sliced potatoes, 12 gm. agar, 5 gm. peptone, 6 gm. dextrose, and 1 gm. yeast extract in 1,000 c.c. water ( $P_H$  6.8 by 6.9).

Little difference was observed at Beltsville between pure cultures of *C. sepedonicum* and those contaminated by certain soft-rotting organisms in respect of the incidence of stalk infection, but the admixture of *Bacillus subtilis*, a green-fluorescent bacterium, and No. 31 resulted in 65.2, 20.6, and 44.4 per cent. tuber infection, respectively, compared with 1.7 per cent. induced by *C. sepedonicum* alone.

At the same station the spread of infection in the vascular bundles of hypodermically inoculated tubers was found to range from 5 to 10 mm. after two months, while after three, positive readings were obtained at 1 and 2 cm. from the needle track in 67 and 23 per cent. of the tubers, respectively. Six weeks after planting seed pieces contaminated by a suspension of *C. sepedonicum* ten minutes earlier, all the shoots had contracted infection, the distance of the organism from the point of inoculation ranging from 1 to 14 cm.

Inoculation experiments in West Virginia in 1940 yielded apparently negative results, but in 1941 up to 57 per cent. infected hills developed from the apparently sound tubers, the importance of this observation lying in the latent presence in seed stock which would have passed all certification requirements of a very high percentage of potential infection.

Neither in Florida nor in Michigan could any indication be obtained of a spread of ring rot from hill to hill or row to row. In a test in the former State in which healthy seed was cut with a contaminated knife, the incidence of infection developing in lots planted immediately and stored in a jute bag for 36 hours amounted to 9.2 and 23 per cent., respectively. In another test, one half each of 148 diseased tubers was planted

immediately after cutting and the other stored as above for 24 hours, the percentages of infection in this instance being 10 and 31, respectively.

In Wyoming the ring-rot organism was found to survive the winter on contaminated sacks left outdoors and kept in a storage cellar, on tubers in outside soil, and the soil surrounding diseased tubers out-of-doors, producing 45, 10, 2.5, and 2.5 per cent. infection, respectively, on healthy seed pieces, but in Florida and Canada negative results were given by overwintering tests. In tests under controlled conditions in Minnesota *C. sepedonicum* persisted for less than a month in non-sterile soil except at temperatures at or near freezing point, which confer some degree of protection.

In date-of-planting experiments in Wyoming the incidence of ring rot in inoculated stands planted on 11th and 21st May and 1st and 11th June amounted to 40.3, 98.7, 90.8, and 100 per cent., respectively, the periods elapsing in each case between planting and first symptom appearance being 88, 67, 63, and 59 days, respectively.

As in previous trials, mercuric chloride, acidulated mercuric chloride, and iodine were the most effective disinfectants for cutting knives, while promising results were also secured by 5-, 10-, and 15-second exposures to boiling water. Injury to the seed pieces from these treatments varied in different States from serious to negligible. Mercuric chloride (1 in 500) was highly effective in the prevention of the spread of ring rot from diseased to healthy seed pieces while other satisfactory preparations for this purpose were acidulated mercuric chloride and cinnex special (containing yellow oxide of mercury and 1 per cent. iodine). As in the case of the cutting knife treatments injury to the seed pieces from these methods of disinfection was very variable in extent. In tests in Wyoming on the relative efficacy of various chemicals as storage-cellar disinfectants, B-K, 2,000 p.p.m., steri-chlor, 500 and 1,000 p.p.m., formaldehyde 1 in 120, and copper sulphate 1 in 50, sprayed on contaminated boards, gave good control of ring rot.

Extensive greenhouse tests in Montana on Netted Gem stocks yielded further evidence in favour of the ultra-violet light method, operated under proper conditions, for the detection of ring rot-diseased tubers. In trials with fluorescent light in Colorado the results obtained at 40° F. were more satisfactory than at 70°.

**BURKHOLDER (W. H.).** *Diagnosis of the bacterial ring rot of the Potato.*—*Amer. Potato J.*, xix, 10, pp. 208-212, 1942.

This is a discussion of the various laboratory procedures advocated for the specific determination of potato ring rot (*Corynebacterium sepedonicum*) or as aids in its diagnosis [see preceding abstract]. The writer's own view, corroborated by the experience of J. B. Skaptason in New York State, is that in the majority of cases the disease is recognizable by an expert on the basis of its symptoms in the living plants: where any doubt as to the identity of the pathogen arises, the ultra-violet light or Gram-stain methods of identification should be applied.

**KOEHNKE (M.) & SHAUGHNESSY (J.).** *Nebraska seed improvement program for Nebraska Potatoes.*—*Amer. Potato J.*, xix, 8, pp. 161-166, 1 diag., 1942.

Potato seed stock improvement was initiated in Nebraska by H. C. Werner [*R.A.M.*, ix, p. 263] in 1923, since when the work has proceeded without interruption, having been taken over in 1936 by the Nebraska Certified Potato Growers. The seed farm acreage has increased from between 5 and 15 acres in 1924 to 125 at the present time (150 in 1939). Two methods of indexing are used, one for individual tubers under controlled greenhouse conditions, and the other for separate hills in Alabama, where numbered lots are grown from January to April, two small tubers from each hill being sent away and the rest stored at 38°. In the greenhouse at 70° to 75° F. seed pieces are removed from the numbered tubers, treated with ethylene chlorhydrine to break the rest period after suberization, and planted in an electrically heated germinating

bench filled with peat moss, and on attaining a height of 1 to 2 in. the sprouts are transplanted into soil benches (65° to 70°). The corresponding tubers are meanwhile placed in cold storage. When the greenhouse plants reach a height of 6 to 8 in., any diseased or weak plants and their corresponding tubers are eliminated, the healthy tubers then being grouped together in strains or varieties. In the second method, according to information received from Alabama, the hills producing tubers which gave rise to healthy plants are retained, and those resulting in diseased or otherwise undesirable material discarded.

In the spring the healthy material is planted out by the tuber unit method in isolated fields, and roguing, especially for spindle tuber and mosaic, is performed four to six times during the summer. All the seed is harvested and stored until the following spring, when it is again tuber unit-planted and rogued regularly. In the autumn it is harvested and released to growers, under satisfactory guarantees, to serve as the source of seed for their certified acreage during the following year.

Throughout the many steps involved in the seed improvement programme, stringent precautions are taken to exclude contamination by ring rot [*Corynebacterium sepedonicum*: see preceding abstracts], all equipment being treated with H T II solution before and after handling each lot of potatoes, the storage space disinfected with copper sulphate, and new sacks used for the movement of all seed form tubers.

Clonal lines are propagated from separately harvested units of each strain, all but one of the original selections (numbering several hundreds) being gradually discarded and the chosen unit becoming the source of continued production.

FOLSOM (D.). **Tuber-line seed plots.** —*Amer. Potato J.*, xix, 1, pp. 225–229, 1942.

From 1933 to 1938, 114 tuber-line seed plots were laid down on 74 farms in Maine, followed in each case during the next year by an inspection to determine the nature and extent of the movement of potato viruses into the seed stocks [*R.A.M.*, xxi, p. 499]. The results of the experiment indicated that the practice of tuber-unit planting, though helpful, did not by itself suffice for the development of mosaic- and leaf roll-free stocks, the likelihood of infection by, or freedom from, these viruses being about equal. The control of both diseases was promoted by earliness and large size of the plots, while mosaic was less prevalent outside the north-eastern region of the State and in isolated situations, leaf roll, on the contrary, being less in evidence in the north-east than elsewhere.

MEYER (G.). **Zellphysiologische und anatomische Untersuchungen über die Reaktion der Kartoffelknolle auf den Angriff der *Phytophthora infestans* bei Sorten verschiedener Resistenz.** [Cyto-physiological and anatomical studies on the reaction of the Potato tuber to the attack of *Phytophthora infestans* among varieties of differing resistance.] *Arb. biol. Anst. (Reichsanst.)*, Berl., 23, pp. 97–132, 1940. [Abs. in *Plant Breed. Abstr.*, xiii, 1, p. 52, 1943.]

A full account is given of the mycelial development in the group A strains of *Phytophthora infestans* on the cut tubers of late blight-susceptible commercial potato varieties and of the W races, and of the resultant changes taking place in the tuber [*R.A.M.*, xix, p. 490; xxi, p. 501]. The W races, all of which are resistant in the foliage, varied in tuber reaction to the fungus. The resistant races were the first to respond to attack by the pathogen, and their reactions proceeded much more rapidly throughout than those of the more susceptible strains; in other respects the behaviour of the resistant and susceptible races was similar, except that in the former no wound periderm between the necrotic and surrounding tissues was observed, neither did any fructifications of *P. infestans* develop. Another feature of the attack on the resistant tubers was their early positive reaction to tannin-detecting agents.

HOLMBERG (C.). **Potatiskräfta och Potatisål i Sverige under 1941.** [Potato wart and Potato eelworm in Sweden in 1941.]—*Växtskyddsnotiser, Växtskyddsanst., Stockh.*, vi, 1, pp. 6–8, 1942.

During 1941, 33 new cases of potato wart [*Synchytrium endobioticum*] were registered in Sweden, 14 of which occurred in localities hitherto unaffected by the disease [*R.A.M.*, xx, p. 157]. The number of fresh foci of infection is stated to be exceptionally low in comparison with the figures for previous years.

THATCHER (F. S.). **A stem-end rot of Potato tubers caused by *Rhizoctonia solani*.**—*Phytopathology*, xxxii, 8, pp. 727–730, 2 figs., 1942.

*Rhizoctonia* [*Corticium*] *solani* was isolated from potato tubers affected by a 'punky' or 'cheesy' stem-end decay in Prince Edward Island, and its pathogenicity experimentally demonstrated. Infection apparently originated at the stolon scar and thence extended radially through the parenchyma tissue for a distance of 1 to 3 cm., finally becoming evident as a dark necrosis with a sharply defined margin, just beyond which copious phellogen formation wholly or partially restricts the further progress of the fungus; where the barrier is not completely effective, another phellogen layer is produced to check the advance of the secondary necrotic zone. In the specimens examined the necrotic cells of the earlier invaded tissues had undergone such widespread disintegration that the contents consisted of little but a mass of starch grains.

The fungus is believed to have entered the tubers through the tracheids in the vascular bundles leading from the stolon scar, in the lumina of which many hyphae were present; these escaped at intervals along the path of the bundle by way of the pits into the parenchyma cells, causing typical degeneration. The prevalence of very wet and cool conditions just before harvest prevented the complete occlusion of the ends of the vascular bundles leading from the stolon by delaying the formation of the wound periderm at the scar, thereby permitting the migration of the hyphae into the tissues during the continuance of the unfavourable weather.

Typical stem-rot symptoms developed in Green Mountain tubers inoculated with mycelium from a potato-dextrose agar culture of *C. solani* held at 5° C. in a moist chamber and in very wet sand at 15° to 20°, establishing the capacity of the fungus to produce decay unless impeded by rapid wound periderm formation.

KÖHLER (E.). **Die Ueberempfindlichkeitsreaktion bei *Solanum nodiflorum* Jacq. gegenüber Stämmen des Tabakmosaik und des Kartoffel-X-Virus.** [The hypersensitivity reaction in *Solanum nodiflorum* Jacq. towards strains of the Tobacco mosaic and Potato X-virus.]—*Z. PflKrankh.*, lü, 9–10, pp. 450–454, 2 figs., 1942.

The author's previous experiments with the virus of acronecrosis on potatoes [*R.A.M.* xvi, p. 707] and with that of tobacco ring spot on beans (*Phaseolus vulgaris*) and chilli (*Capsicum annum*) [ibid., xx, p. 422] showed that hypersensitivity on the part of the respective hosts to the viruses in question is associated with the production of toxins by the latter. In the series of tests herein described, *Solanum nodiflorum* plants, 35 cm. in height, were inoculated on 11th June 1941 by leaf-rubbing with the juice from Samsun tobacco of five strains of the X-virus of potatoes, viz., Mb 12, CsA, Cs37, Bf, and Us (all belonging to the X<sup>N</sup> group except Bf, a derivative of X<sup>E</sup>), and four of that of tobacco mosaic, namely, TM/S, TM/w, G2, and G7, four plants being used for each virus.

The following observations were made a week later. No symptoms (latent infection) were induced by Mb 12, CsA, TM/S, TM/w, or G2; Cs37 caused the formation of numerous inconspicuous, yellowish lesions with small, necrotic circles or spots in their centres; a similar but milder spotting followed inoculation with Bf; Us and G7 were both responsible for the development of many bluish-green, circular spots, with necrotic dots and areas in their centres, against a yellow-discoloured background. The interest of these data lies in two viruse strains, Us and G7, belonging to different classes giving

of toxic proteins, which are presumably, judging by the agreement of the responses evoked, constitutionally identical. Both the strains under observation arose on Samsun tobacco as spontaneous mutants from 'normal' strains of their respective parent viruses. Hence it would appear that the strains of different viruses are capable of acquiring certain identical radicals, the choice of which may be conditioned by the substratum.

A repetition of the experiments during the following winter gave negative results, confirming previous observations as to the decisive influence on the outcome of inoculation of the physiological condition of the host or the particular leaves infected.

KUILMAN (L. W.). **Wortelstudien aan tropische landbouwgewassen. I. Wortelontwikkeling en vruchtbaarheid.** [Root studies on tropical agricultural crops. I. Root development and fertility.]—*Landbouw*, xvii, pp. 673-690, 1941. [Abs. in *Plant Breed. Abstr.*, xiii, 1, p. 46, 1943.]

'Mentek' [root rot], a rice disease probably attributable to potassium deficiency, is stated to be less prevalent than formerly in the Dutch East Indies [*R.A.M.*, ix, p. 161; x, p. 298, *et passim*], possibly owing to the extended use of the resistant varieties developed at the Institute of Agronomy (Cultuurtechnische Instituut). In two instances the highly susceptible Temas variety proved quite resistant to root rot when planted at the rate of 15 plants instead of one per hole. Resistance appears to be correlated with a well-developed, dense root system with numerous very fine root fibres, such as characterizes the Poeloet Nangka, Gading Kloear, and Moering varieties, which showed little or no trace of potassium deficiency even in trials on soil with a low content of this element, indicating that their abundance of fibrous rootlets facilitates the intensive utilization by the resistant sorts of soil minerals. A survey of varieties graded according to the type of root system showed that among the resistant rice varieties are many widely cultivated for their prolific yields, e.g., Oentoeng and Tjina.

MARTIN (T. L.) & GRAHAM (R. C.). **Influence of organic matter decomposition on the fungus flora of the soil.**—Abs. in *Proc. Utah Acad. Sci.*, xviii, pp. 11-12, 1941.

The soil organisms responsible for the decomposition of organic matter utilize the soluble materials first, hence the percentage of insoluble matter increases with time. Previous experiments have shown that both the quantity and quality of soil fungi undergo extensive changes corresponding to these chemical processes, *Mucor* and *Rhizopus* spp. developing most profusely during the first few weeks and being succeeded in turn by *Penicillium* and *Aspergillus* spp., and ultimately, towards the close of the decomposition period, when resistant materials predominate, by dark-coloured moulds, such as *Cladosporium* and *Trichoderma* [including *C. herbarum* and *T. viride*].

In experiments at Provo, Utah, the influence of sweet clover [*Melilotus*], lucerne, Russian thistle [*Salsola kali*], white top beets and roots, and straw on the fungal population of the soil was studied, 2 per cent. of each material being incorporated and the specimens kept at the optimum moisture content for eight weeks, during which they were sampled weekly. The results confirmed those obtained in former trials. The *Mucor* and *Rhizopus* spp., after vigorous initial growth, gradually ceased to develop and had disappeared by the sixth week; the incidence of *Penicillium* and *Aspergillus* spp., which rose as that of the Mucorales declined, began to decrease about the fifth week and were replaced by *Cladosporium* and *Trichoderma*, which continued to multiply until the end of the trials. The only difference between the effects of the various materials tested was the somewhat more rapid action of the legumes on the microbial sequence.

TAVERNETTI (J. R.). **A continuous soil pasteurizer.**—*Agric. Engng, St. Joseph, Mich.*, xxiii, 8, pp. 255-256, 261, 1 fig., 1 diag., 1 graph, 1942.

A tabulated account is given of experiments conducted at the University of California to determine the utility of a continuous soil pasteurizer with a 4-in. belt conveyor of the type constructed and tested in New York and described by Newhall

[*R.A.M.*, xv, p. 824]. The average rate of pasteurizing was approximately 5 cu. ft. of loose soil per hour or 1 cu. ft. per 1,000 w. of heating capacity, the most favourable moisture content for the soil ranging from 3 or 4 per cent. with pure sand to as much as 25 or 30 per cent. in the case of loam, peat, leaf mould or mixtures of these. The electric energy consumption averaged about 1 kw.-hr. per cu. ft. soil. Damping-off (*Pythium*) of sugar beet seedlings and *Rhizoctonia* [*Corticium solani*] on Whippoorwill cowpeas were controlled by heating the soil to 150° F. or above.

WHETSTONE (R. R.), ROBINSON (W. O.), & BYERS (H. G.). **Boron distribution in soils and related data.**—*Tech. Bull. U.S. Dep. Agric.* 797, 32 pp., 1 fig., 1942.

A systematic survey of the boron status of soils throughout the United States showed that three large areas are likely to suffer from boron deficiency: Atlantic and Gulf coasts from Maine to Texas; northern Minnesota, Wisconsin, and Michigan; and California and the Pacific Northwestern States. Natural boron toxicity is believed to be unlikely to occur except in arid regions; and toxicity from added boron more likely in acid, sandy soils, often previously deficient in boron. Injury to apples, alfalfa [lucerne], celery, and beets resulting from boron deficiency in Oregon, West Virginia, and North Carolina was found associated with low boron content of the soil. The high boron content of lucerne stems and leaves from Raft River, Idaho (69 p.p.m.) suggests that 'yellows' there is not due to boron deficiency but to some other cause.

RANGASWAMI (M. S.). **Progress report of the forest administration in Coorg for 1940-41.**—Bangalore, Mysore Residency Press, 49 pp., 1942.

The following item of phytopathological interest occurs in this report (p. 5). During the period under review, the incidence of spike on sandal [*Santalum album*] increased in zones already affected by the disease and developed sporadically in regions hitherto free from it. After lopping and burning the leaves and twigs, all the spiked trees were treated with sodium arsenite and uprooted [*R.A.M.*, xviii, pp. 138, 818].

BOSE (A. B.). **Alternaria on leaves of Sunflower in India.**—*J. Indian bot. Soc.*, xxi, 3-4, pp. 179-184, 1942.

From shrivelled sunflower leaves bearing small, oval, often depressed, whitish spots at the Carmichael Medical College, Calcutta, the writer isolated *Alternaria tenuis* in pure culture on 3 per cent. malt agar and Brown's synthetic medium, the identification having been confirmed by G. W. Padwick and M. Mitra. The pathogenicity of the fungus was established by inoculation experiments with conidial suspensions on wounded and unwounded leaves.

MOURASHKINSKY (K. E.). **Защита Подсолнечника от болезней в восточных районах** [Control of diseases of Sunflower in the eastern districts].—*Ex K весеннему севу 1942 года. Сборник статей.* [On the occasion of spring sowing in 1942. Collection of papers.], pp. 37-39, Издат. Наркомзема СССР [Publ. Off. People's Comm. Agric. U.S.S.R.], Omsk., 1942.

The three diseases mainly responsible for crop losses of sunflower in Siberia are stated to be white rot [*Sclerotinia*] [*S. sclerotiorum*: *R.A.M.*, xii, p. 571], generally prevalent in the more northern districts and in the southern only in wet seasons; *Verticillium* disease [*V. dahliae*: loc. cit.], particularly destructive in southern districts in dry seasons; and rust [*Puccinia helianthi*: loc. cit. and *ibid.*, xvi, p. 539], described as less serious than in European Russia, probably owing to the less favourable climatic conditions obtaining in Siberia. The amount of infection caused by either of these three fungi varies greatly from year to year and from district to district. The yearly losses in crop due to all diseases are stated to amount on the average to about 20 per cent., but it is considered possible to reduce these losses drastically by seed disinfection, early sowing, thorough weeding, removing and burying or burning plants showing the first symptoms of disease, as well as stalks left in the field after harvesting, deep ploughing in spring and autumn, and by adopting a triennial rotation.

KEYWORTH (W. G.). **Verticillium wilt of the Hop (*Humulus lupulus*)**.—*Ann. appl. Biol.*, xxix, 4, pp. 346–357, 1 pl., 2 figs., 1942.

The author's investigations into the wilt disease of hop, caused by *Verticillium albo-atrum* or, more rarely, by *V. dahliae*, were continued from 1938 to 1941 and confirmed largely the conclusions previously reached [*R.A.M.*, xviii, p. 709; xix, p. 364]. The results of three field experiments failed to show a relation between occurrence of wilt and local variations in soil moisture conditions. Soil disinfection with 2 per cent. formalin at the rate of 8 gals. per sq. yd. gave promising results. Diseased leaves and bines and infected cuttings for planting were again found to be important means of spreading the disease. In addition to general hygienic measures aimed principally at removing sources of infection which had been previously recommended for the control of the disease in the fluctuating and the progressive type of attack, it is advised in the case of small first outbreaks to cut down and burn all the bines of the diseased plants and of adjacent healthy ones, then to remove the soil (1 yd. square and 1 yd. deep) from the cleared site of each plant, pour 8 gals. of 2 per cent. formalin into each hole, fill the holes up with uninfected soil, and finally to treat the whole area from which the plants have been removed with 2 per cent. formalin at the rate of 8 gals. per sq. yd. Such areas can be replanted after three to four weeks, but should be closely watched for wilt during the following season.

WIEHE (P. O.). **La sensibilité de quelques variétés de Cannes aux principales maladies existant à Maurice**. [The susceptibility of certain Cane varieties to the principal diseases occurring in Mauritius].—*Rev. agric. Maurice*, xxi, 5, pp. 225–226, 1942.

A table is given showing the réactions of 32 sugar-cane varieties cultivated in Mauritius to the seven principal diseases affecting the crop in the island, namely (in descending order of importance), gummosis (*Bacterium* [*Xanthomonas*] *vasculorum*), leaf scald (*Bact. albilineans*), red rot (*Colletotrichum falcatum*), root rot (*Pythium* and *Rhizoctonia* spp. in conjunction with eelworms), smut (*Ustilago scitaminea*), chlorotic streak, and eye spot (*Helminthosporium sacchari*).

THIND (K. S.). **The genus *Peronospora* in the Punjab**.—*J. Indian bot. Soc.*, xxi, 3–4, pp. 197–215, 1 col. pl., 16 figs., 1942.

Included in this taxonomic survey of 16 species of *Peronospora* [*R.A.M.*, iii, p. 241] collected on 20 hosts in India from January to April, 1940, are six new fungus and seven new host records for the country, among which may be mentioned *P. viciae-sativae* on vetch, *P. lathyri-palustris* on *Lathyrus sativus*, *P. trigonellae* on *Trigonella foenum-graecum*, *P. aestivalis* on lucerne and *Medicago denticulata* (an aggressive parasite on the former), *P. trifolii-repentis* on *Trifolium resupinatum*, *P. arborescens* on *Papaver rhoeas* [*ibid.*, xxi, p. 99], and *P. brassicae* on cabbage, turnip, radish, and *Malcolmia africana* (apparently the first report of the mildew on this host).

Discussing the nomenclature of the *Peronospora* on *Chenopodium album*, the writer draws attention to its reference to *P. effusa* by Butler and Bisby [*ibid.*, xi, p. 545] and to *P. variabilis* Gäumann by Mundkur [*ibid.*, xviii, p. 57]. Actually the host is liable to infection by both species, the differences between which are shown in tabular form.

**Dutch Elm disease quarantine. Revision of quarantine and regulations effective October 1, 1941**.—U.S.D.A., B.E.P.Q., 4 pp., 1942.

As from 1st October 1941 the 'regulated areas' for the purpose of Dutch elm disease (*Ceratostomella ulmi*) control are extended to include parts of nine counties of Pennsylvania and additional sections of Connecticut, New Jersey, and New York in which the fungus has been located [*R.A.M.*, xix, p. 128]. The regulations prohibit inter-State movement from the regulated areas to any area outside their radius of all parts of elms of all species, with the exception of elm timber or products manufactured from or containing elm wood, if entirely free from bark.